BASIC MODIFICATION OF THE BC-457, BC-458 or BC-459
AS A VFO FOR MODEL 10 OR 20 MULTIPHASE EXCITER FOR 12 VOLT OPERATION

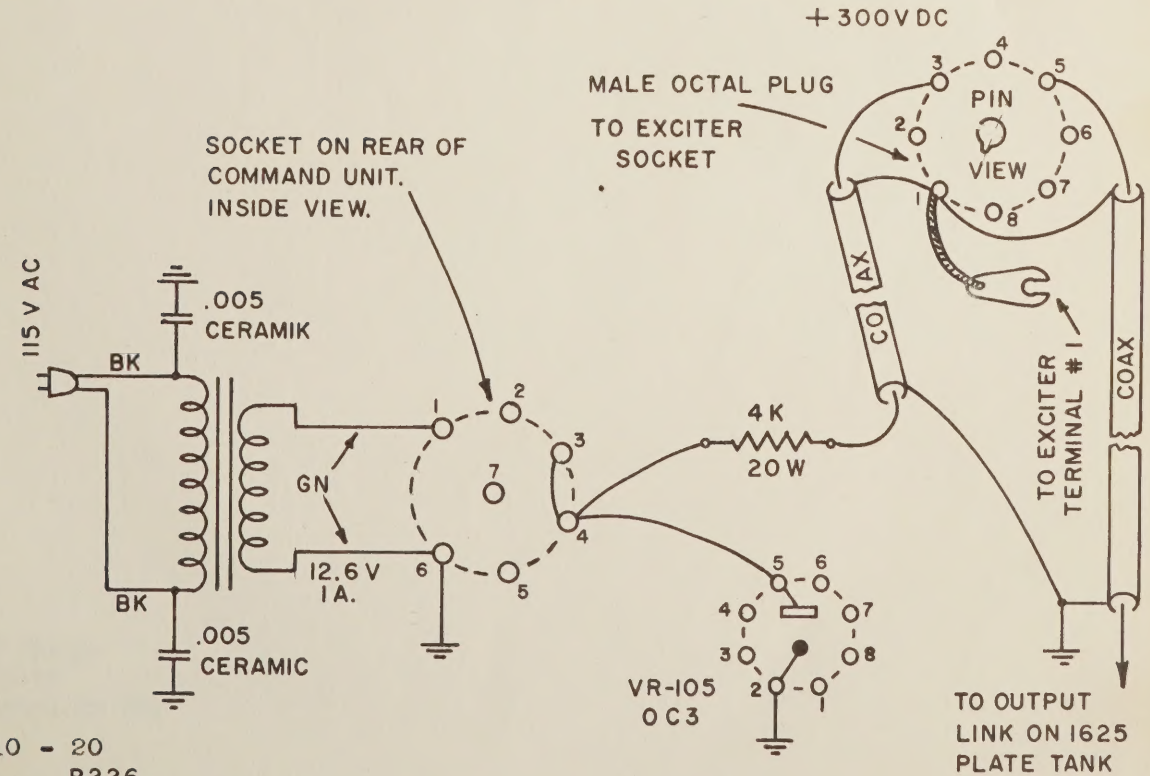
The contacts on the keying relay (beneath the chassis) should be closed by using jumpers or soldering the contacts together. This applies B plus to the oscillator and also grounds the cathode circuit on the 1625 stage. Remove the 1629 eye tube and also the 1625 located near the tuning shaft. Jumpers should be installed across the filament terminals of these unused sockets. Only one 1625 is necessary for proper operation.

The antenna loading coil and antenna relay are not necessary and can be removed. The coax cable to the Exciter can be attached directly to the output link of the 1625 final tank coil.

Plate voltage for the VFO is supplied from the Exciter through an octal socket on the rear.

The electrical connections for the external wiring are shown below.

Advance the antenna coupling adjustment on the VFO to the point where additional coupling will not increase the Exciter output. Over injection to the mixer will generate harmonics of the VFO frequency that can appear in the output as spurious radiation.



10-5-56
VFO for 10 - 20
MV131 P226
108-9 MX 108A-9MX

BC 458 VFO CHANGE NOTICE

There have been several cases where oscillation or regeneration has been experienced with the 10A, 10B and 20A Exciters on the higher frequency bands. It has been determined that the coaxial cables to the 458 VFO can pick up radiated RF due to inadequate shielding. The use of Amphenol #21204 Triaxial cable effectively reduces the tendency towards oscillation and regeneration. These cables should be connected as shown on drawing #P208.

Each BC-458 Kit now contains the following cable:

18" - RG58A/U for coax "F" (from oscillator stator to band switch)

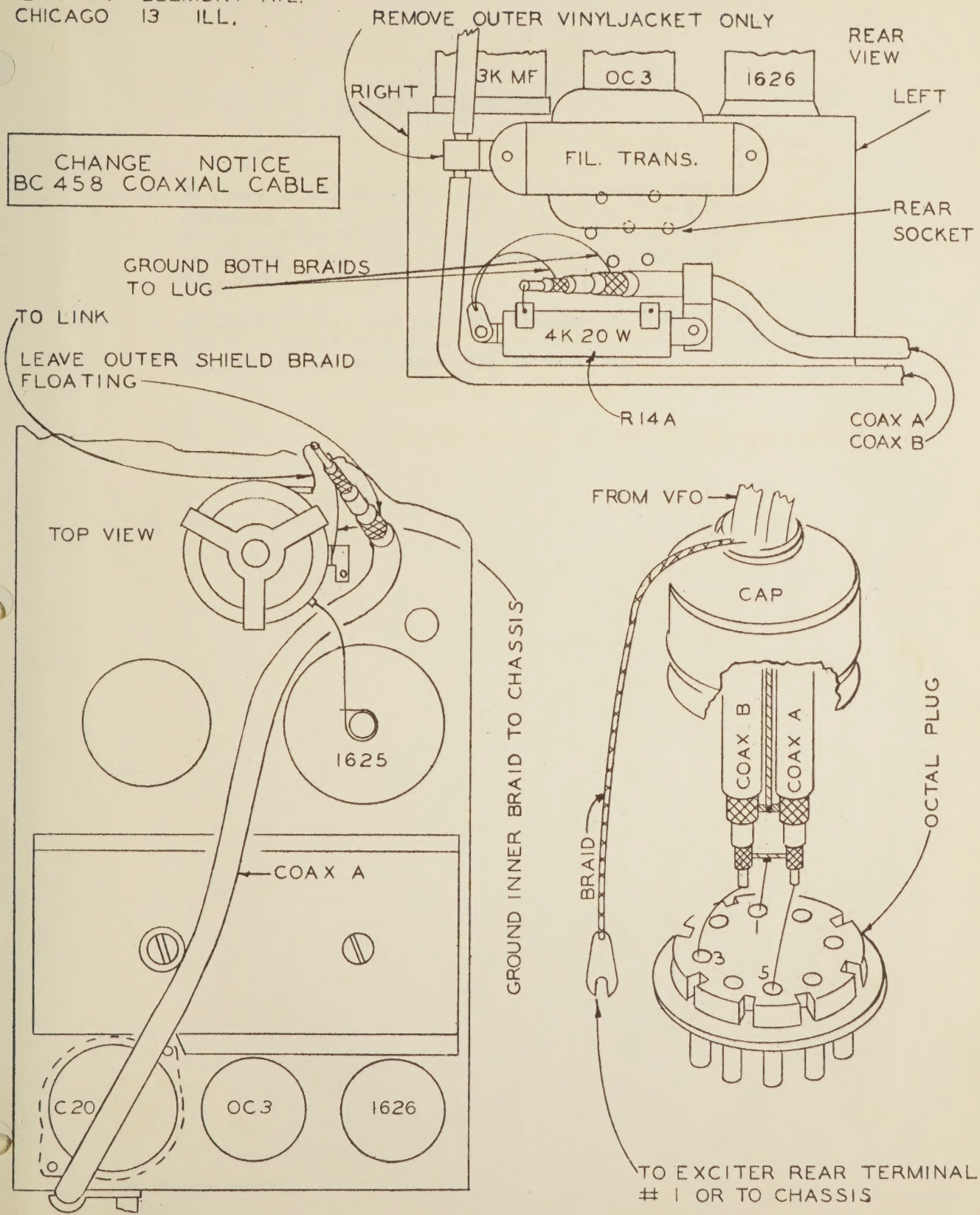
9' - #21-204 for coax "A" and "B" (RF and B plus)

VFO Change
4-29-59
Printed in USA

CENTRAL ELECTRONICS
1247 W. BELMONT AVE.
CHICAGO 13 ILL.

P208 4-13-59

CHANGE NOTICE
BC 458 COAXIAL CABLE



BC-458 CHANGE NOTICE

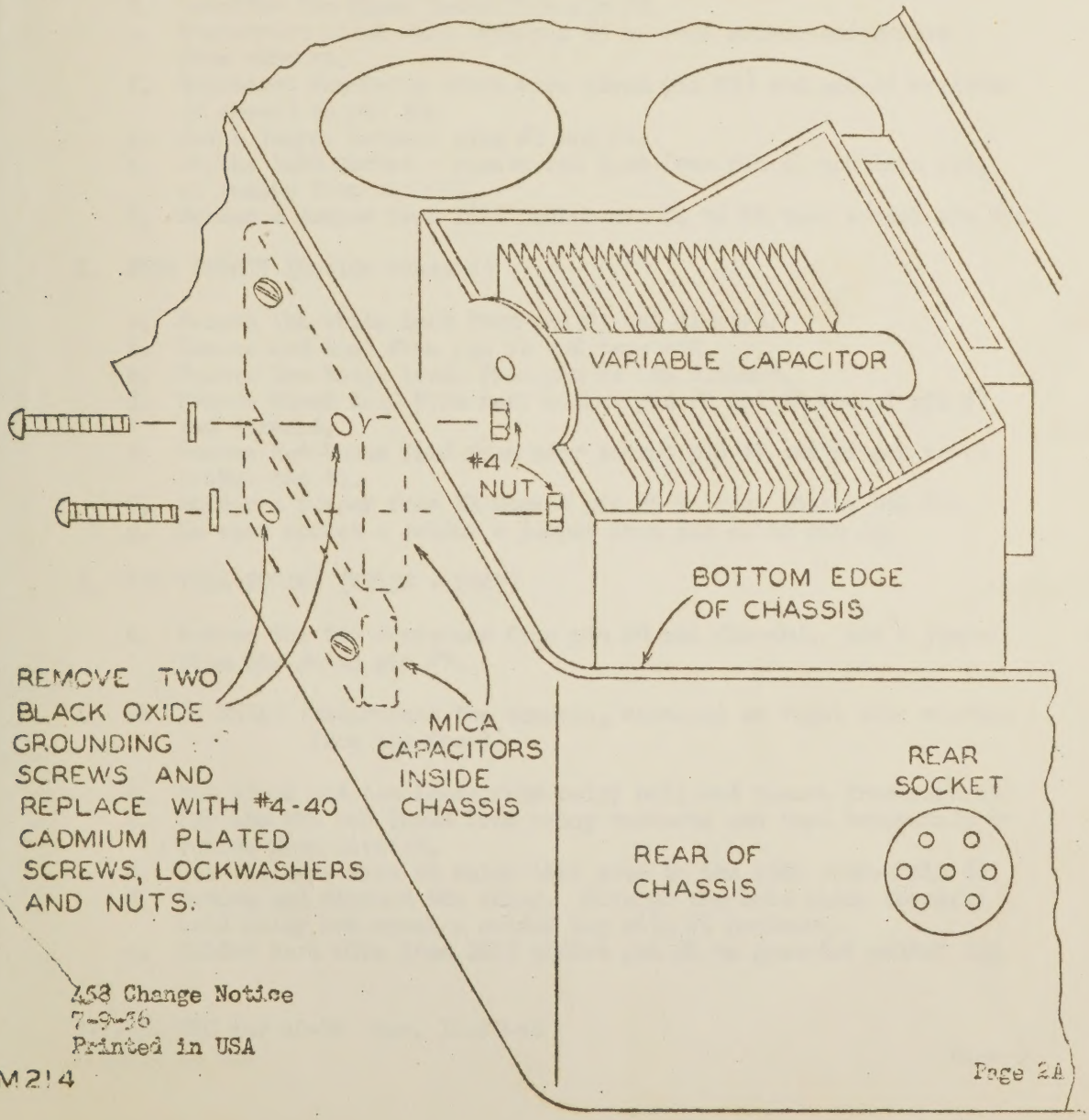
In order to provide sufficient output when the 1625 is operating as a frequency tripler to 16 mc. (for 40 meter operation) the Voltage Regulator tube has been changed to a VR105. The dropping resistor for the Regulator Tube is now 4000 ohms.

If the 1625 grid bias resistor (located on terminals 6 and 7 on the VR tube socket) is increased to 100,000 ohms, additional reserve output will be obtained.

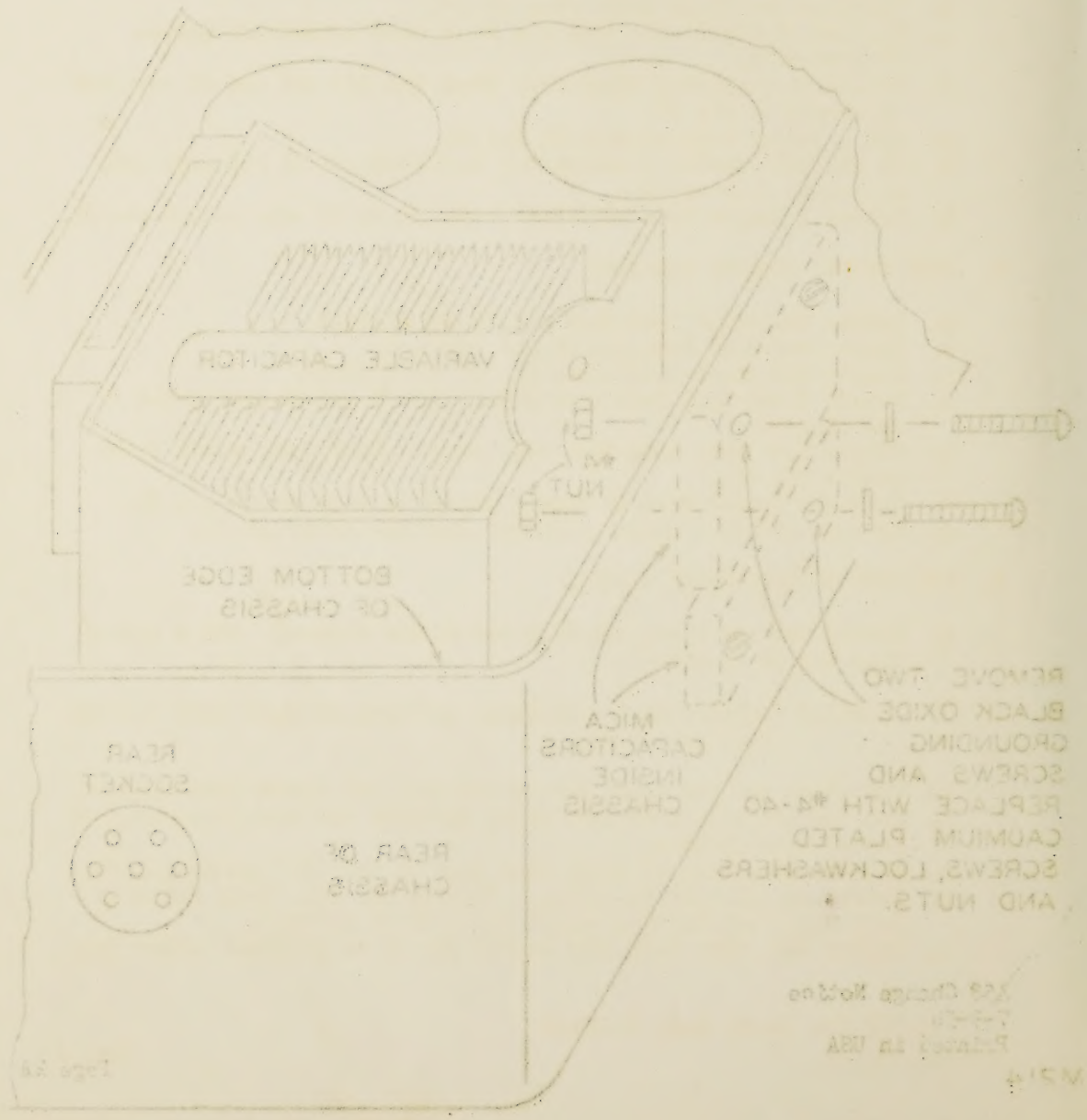
VFO Change Notice
5-11-56
Printed in USA

The black oxide screws sometimes make poor R.F. contact and must be replaced. Before installing coax F, remove two black oxide #3 nuts, screws and washers from the right side of chassis near rear, as shown. These two screws hold two mica capacitors and two ground lugs to the side of chassis. The two ground lugs should be cleaned, if necessary, to insure good contact. Two #4-40 x 5/8" screws, nuts and lockwashers are used to replace the #3 screws, as shown.

Place a lockwasher under head of screw; push through hole in side of chassis and capacitor. A #4 nut is used to hold lug and capacitor to inside of chassis. If your 458 is painted black wrinkle, it is advisable to scratch paint from around the two holes before adding #4 screws.



458 Change Notice
7-9-56
Printed in USA


VARIABLE CAPACITOR
#4 NUT
BOTTOM EDGE OF CHASSIS
MICA CAPACITORS INSIDE CHASSIS
REAR SOCKET
REAR OF CHASSIS

DETAILED CONVERSION INSTRUCTIONS
FOR
BC-457, BC-458, BC-459 WITH 12 VOLT OPERATION

This modification procedure allows the installation of a VR105 into the socket originally intended for the crystal calibrator and mounts the filament transformer and dropping resistor on the rear of the chassis.

NOTE: Socket connections read clockwise from underneath chassis. Pin #7 on power socket (rear) is the center pin.

1. CRYSTAL SOCKET (Center octal socket rear of chassis)

a. Remove resistor between pin #3 and #8 - discard.
b. Remove black lead from pin #3 and take out of circuit.
c. Unsolder end of resistor from pin #5.
d. Unsolder two black leads from pin #5.
e. Disconnect black wire from pin #5 on rear socket and remove from circuit.
f. Reconnect remaining black wire (from pin #5) and end of resistor (c above) to pin #6.
g. Add a jumper between pins #1 and #2.
h. At the 1626 socket - remove red lead from pin #4 and tape end, or remove from circuit.
i. Solder a jumper from 1626 socket pin #4 to VR tube socket pin #5.

2. REAR SOCKET (inside chassis)

a. Remove the white lead from pin #1 and discard.
b. Remove red lead from pin #4 and tape end.
c. Remove two black leads from pin #2 and discard.
d. Remove black lead from rear socket pin #6 and VR socket pin #7 and discard.
e. Remove Red-White lead from rear socket pin #7 and attach to VR socket pin #5.
f. Solder a jumper from VR socket pin #5 to rear socket pin #4.
g. On rear socket - solder a jumper from pin #3 to pin #4.

3. EYE TUBE SOCKET (VT138 - 1629)

a. Remove the two resistors from pin #8 and discard. Add a jumper from pin #2 to pin #7.

4. AT THE RELAY (underneath the chassis, centered on right side viewing from the front)

a. Cut black and tan leads from relay coil and remove from circuit.
b. Cut the two red leads from relay contacts and tape separately or remove from circuit.
c. Cut the bare wire at relay that goes to the 1625 socket pin #6.
d. Remove and discard the relay. Enlarge the hole which formerly held relay and mount a solder lug with #6 hardware.
e. Solder bare wire from 1625 socket pin #6 to grounded solder lug.

5. 1625

a. Add a jumper from pin #1 to pin #7 on the 1625 socket next to the tuning shaft.

6. FILAMENT TRANSFORMER 12 volts - 1 amp

a. Mount on 1/2" spacers slightly above (horizontally) rear socket with secondary (green) leads down. Place two solder lugs under screw heads inside chassis.
b. Trim secondary leads to proper length and solder into rear socket pins #1 and #6 (from outside)
c. Drill hole for 3/8" grommet slightly below and to left of rear socket (viewed from rear).
d. Solder filament transformer primary leads to rear socket pins #2 and #5 outside of chassis.
e. Solder a .005 ceramic by-pass condenser from pin #2 on rear socket to ground lug.
f. Solder a .005 ceramic by-pass condenser from pin #5 on rear socket to ground lug.
g. Insert proper length of primary A.C. cord through grommet hole, tie a knot and solder leads to pins #2 and #5 of rear socket.

VR TUBE DROPPING RESISTOR 4000 ohm 20 watts

a. Mount a 4000 ohm 20 watt resistor on the back of the chassis slightly below and to the left of rear socket. (Resistor is mounted outside chassis for heat radiation.)
b. From outside chassis, solder a jumper from rear socket pin #4 to low potential end of 4000 ohm 20 watt resistor.
c. Plate voltage is supplied from the Exciter through an octal plug and cable, as shown on Page 2. Inner conductor is soldered to one lug of 4000 ohm 20 watt resistor.

ADAPTING THE BC-458 FOR 20 AND 80 METER OPERATION

The BC-458 (5.3 to 7 mc.) is recommended as a VFO rather than the BC-457 (4 to 5.3 mc.) for greater stability.

ADJUSTING THE FREQUENCY RANGE

After completing the proper modifications, plug the VFO into the socket on the rear of the Exciter. Remove the oscillator section shield can. Set the single plate adjustment trimmer to mid-capacity. Now loosen the two bristol set screws on the oscillator padding capacitor. It will be necessary to increase the capacity until the oscillator is at 5 mc. with the dial set at 5.3 mc. after the shield can is replaced. The iron core slug will change the frequency several hundred kilocycles and the capacity should be increased in small steps until 5 megacycles is reached. By drilling a 3/8" hole approximately 3/4" below the present one, the adjustment can be made with the shield can in place. If your receiver does not tune to 5 mc., use the Exciter tuned to 4 mc. with some carrier inserted. After the correct setting has been determined, be sure to tighten the set screws.

The amplifier air padder located beneath the chassis must be tuned to the new oscillator frequency. Adjust for maximum VR tube brilliance, or for maximum Exciter output with the VFO coupling set to about 4.

BANDSPREAD MULTIBAND OPERATION OF THE BC-458

By the addition of a bandswitch, three miniductors and a 50 uufd. variable capacitor, operation in the 160, 80, 40, 20 and 15 meter bands is possible. CW operation from 21,000 to 21,200 is not recommended with this conversion, but satisfactory performance is obtained in the rest of the 21 mc. band.

It is suggested that whenever the 1625 stage is used as a frequency multiplier, the filament of the oscillator tube be operated on direct current to minimize hum. One method of obtaining this DC is to use a 12 volt filament transformer for the unit, with a full wave bridge rectifier and a filter capacitor of at least 1000 mfd.

Bandspread is accomplished by carefully removing the rotor plates from both the oscillator and amplifier variable tuning capacitors. Those plates farthest from the worm gear drive should be removed so that only 8 rotors remain in use in each tuning capacitor. With the capacitors open, gently rock the plates, one at a time, with a long nose pliers until they become loose. If too much force is used, the rotor shaft may become dislodged and you will then very likely spend the rest of the day and evening recovering the small ball bearings and trying to figure out a method of reassembling everything. Care should also be taken not to exert any pressure on the stator sections as this can cause the glass insulating beads to fall out.

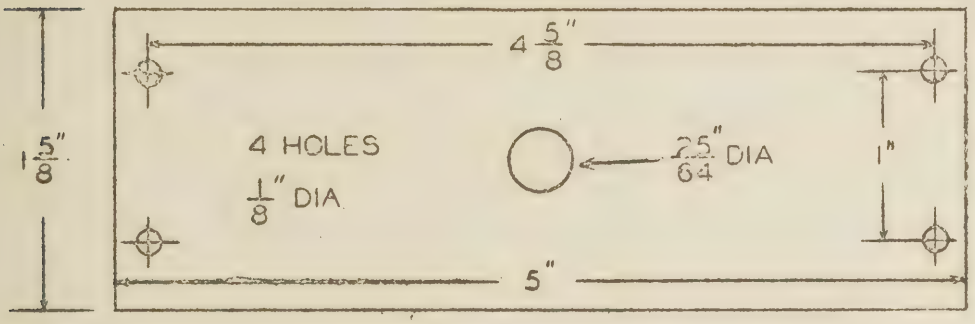
The 50 mmfd. variable capacitor should be mounted in the hole occupied by the antenna binding post. File two notches in the edges of the hole to accept the mounting screws.

For 40 meter operation a coil consisting of 3-1/4 turns of #3014 B & W Miniductor (8 turns per inch) is shunted across the amplifier plate inductor so that it will triple into the range of 16 to 16.3 mc.

For 160 meters a coil consisting of 6-1/2 turns of #3015 B & W Miniductor (16 turns per inch) is used to double to 10,800 to 11,000 kc. Five turns are used for 15 meters which requires 12,250 to 12,450 kc.

The antenna loading coil assembly should be removed and a metal plate installed in the window.

Suggested plate dimensions:



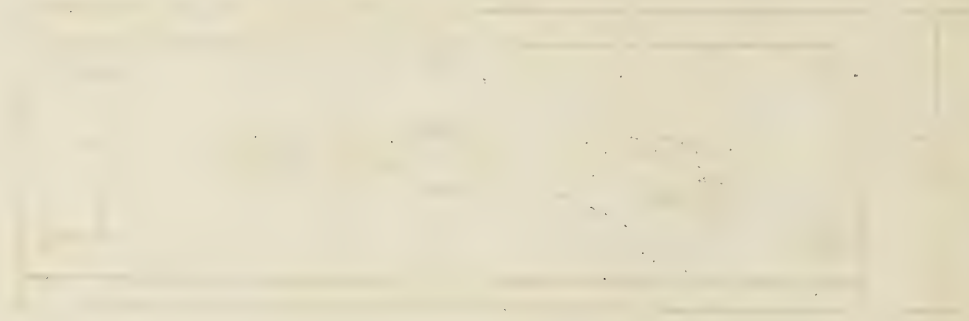
The entire unit should rest on a sponge rubber pad or soft rubber feet.

ALIGNMENT PROCEDURE

Set receiver and exciter to 21,450 kc. Advance the CARRIER knob. With the VFO switch in the 21 mc. position and the dial at 7.0 mc., adjust the oscillator air padder (inside the can) for zero beat. This will occur with a little more than half capacity and the slot in the shaft will be slightly beyond the horizontal position, at an angle about 8:30 to 2:30.

With the receiver and exciter tuned to 4.0 mc., set the VFO bandswitch to 80 meters and dial to 5.3 mc. Tune the 50 mmfd. APC capacitor for zero beat. Zero beat should occur with the plates of this capacitor about 95% meshed. If zero beat occurs at less than 95% capacity you have selected the wrong signal at 21,450 kc. Peak amplifier air padding capacitor (under the chassis) for maximum VR tube brilliance or maximum exciter output with the VFO loading set at 4.

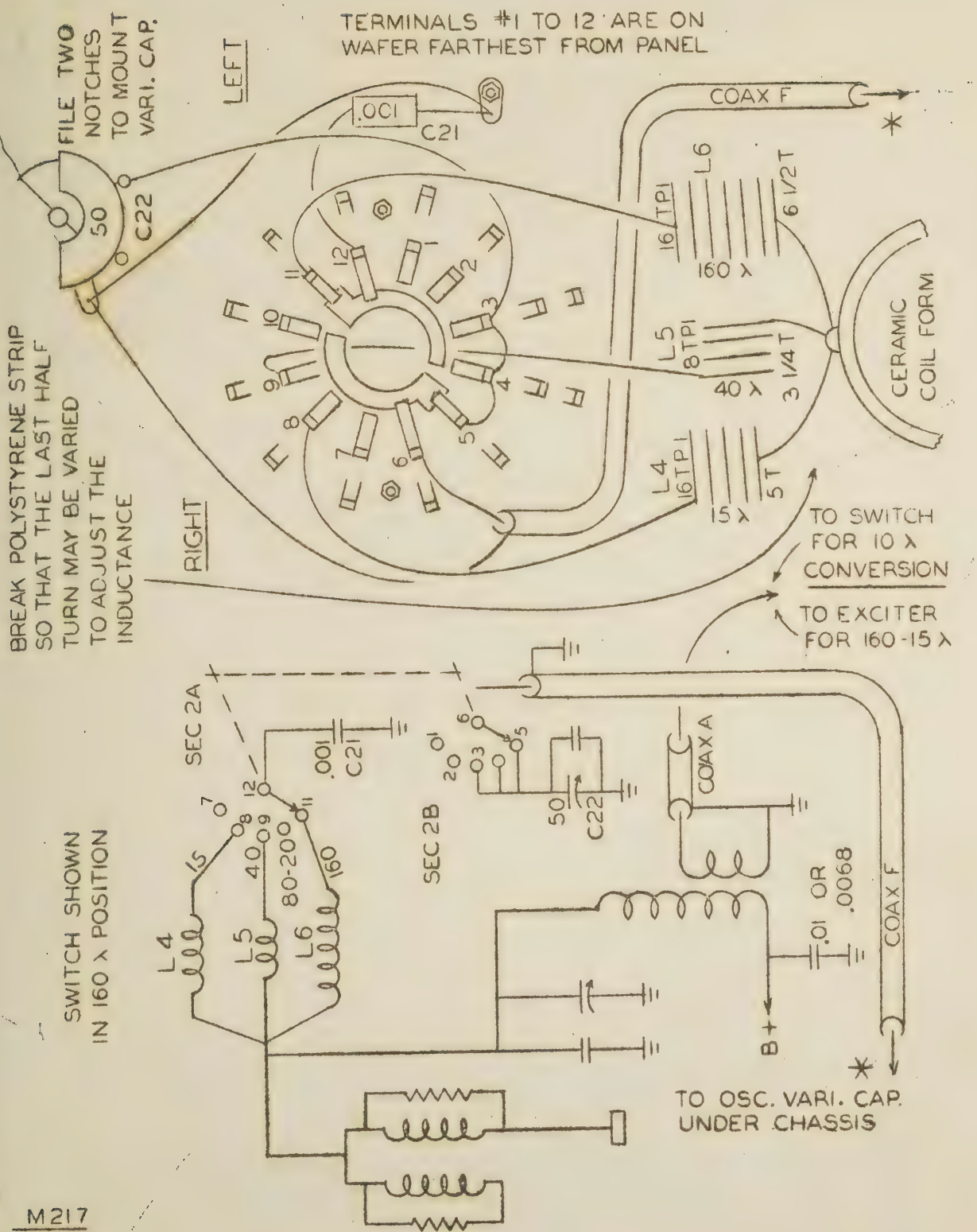
Now return to the 21 mc. band. Slowly replace the large shield cover on the BC-458 and observe the effect upon the output of the exciter. Replacing this cover reduces the inductance of the coils and increases the



resonant frequency. When the cover is off, the coil should have slightly more inductance than necessary. The inductance may be adjusted by breaking the polystyrene strip so that the last half turn can be varied to trim the inductor to the required value. This effect must also be checked on 40 and 160 meters.

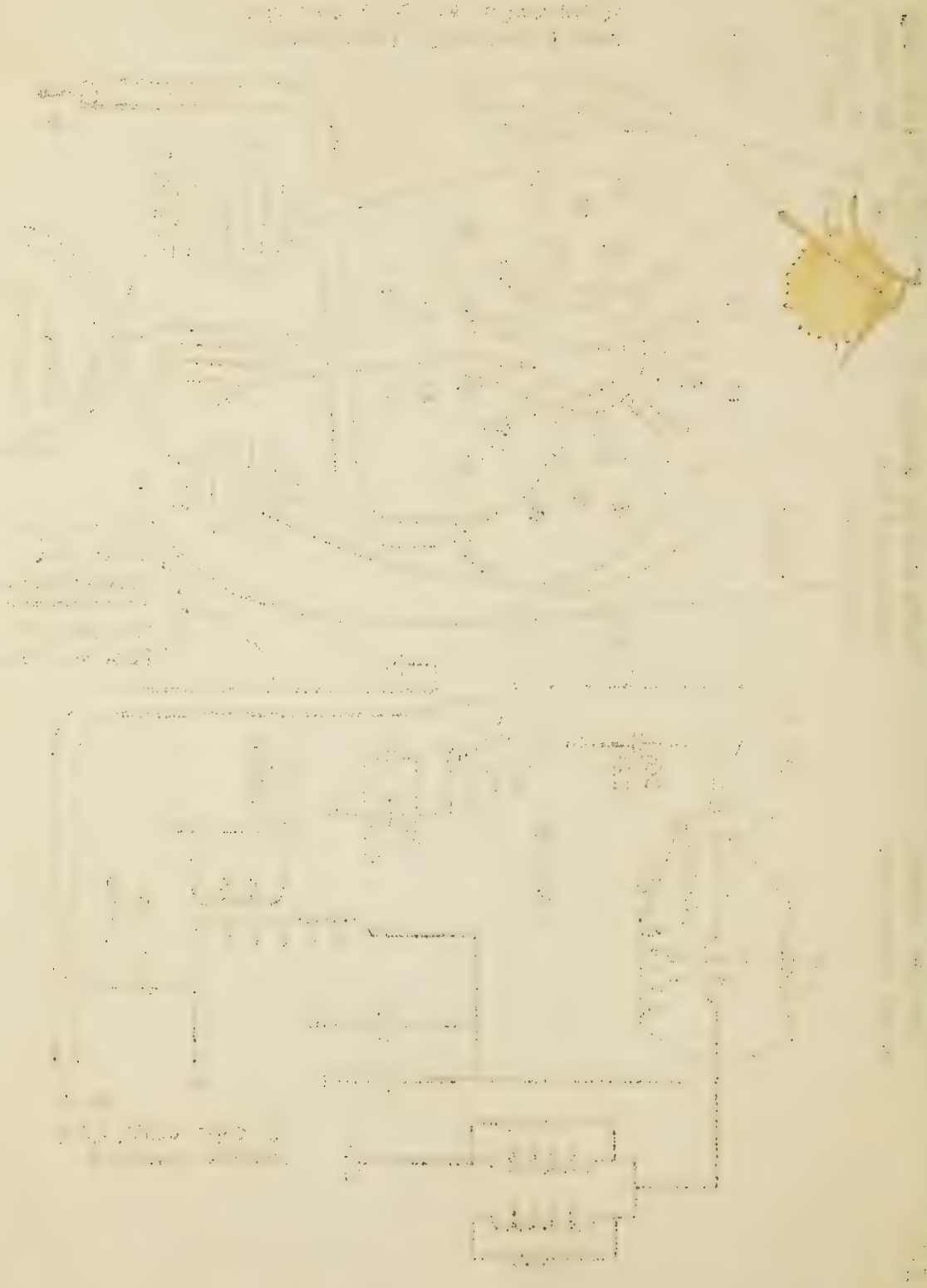
CALIBRATION CHART FOR BANDSPREAD VFO

1800	6485	7000	6248
1825	6531	7100	6363
		7200	6481
1875	6627	7300	6605
1900	6674		
1925	6724	14000	5300
		14100	5562
3500	6585	14200	5844
3700	6153	14300	6153
3800	5844		
3900	5562	21250	6715
4000	5300	21350	6855
		21450	7000



M217
101MX
VFO 10-20
10-27-54 Rev. 12-4-58

FIG. 3



MODEL 458K - 5 BAND BC-458 CONVERSION KIT WITH BANDSPREAD DIAL
FOR OPERATION ON 160, 80, 40, 20 and 15 METERS
PRICE COMPLETE - $19.50

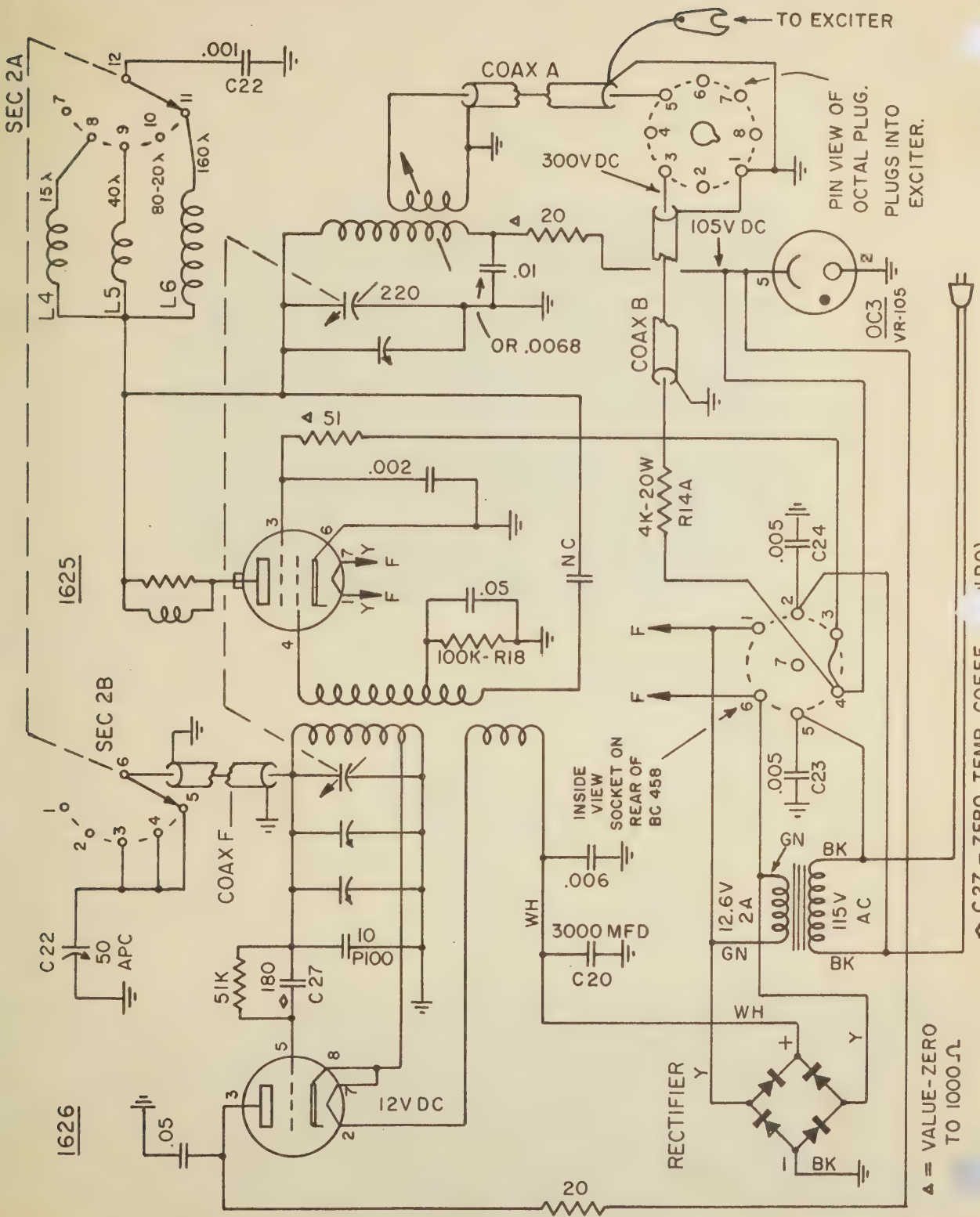
*1	- Calibrated dial scale	$2.00
*1	- 0C3/VR105 voltage regulator tube	1.32
*1	- 12 volt 2A filament transformer 27PF356	2.00
*1	- Full wave bridge selenium rectifier 600 ma	2.25
*1	- Rectifier mounting bracket	.25
*1	- 3000 mfd. 12V filter capacitor and mounting plate	2.00
*1	- Bandswitch, 4 pole 5 pos. and SPST, ceramic	2.50
*1	- Bandswitch mounting plate	.50
*3	- Miniductors cut to size	1.00
*1	- 20 watt 4000 ohm resistor with mounting brackets	.66
*1	- Octal male plug and cap	.23
*1	- 50 mmfd. var. capacitor, APC	1.23
*1	- Capacitor, ceramic 10 mmfd. pos. 100 (White, Black, Black, Brown)	.29

1 - Bristo Wrench
4 - Rubber Feet
4 - #6 sheet metal screws for rubber feet
2 - .005 mfd. ceramic capacitors
1 - .001 mfd. mica capacitor (10% tan)
1 - .006 or .0068 mica capacitor, tan. (For Navy T21/ARC5 only)
10 - Ft. RG58AU coaxial cable for RF and B plus
1 - Knob for bandswitch
2 - Transformer mounting spacers 7/16" long
1 - Line cord
2 - 3/8" grommets
3 - Cable clamps
6 - 4-40 screws, 4 nuts, 2 lockwashers
1 - #4 soldering lug
9 - #6 shakeproof ground lugs
2 - 3/8-32 nuts
1 - 3/8" lockwasher
3 - 6/32-1" screws
5 - 6/32-5/16" screws
8 - 6/32 nuts
9 - #6 lockwashers
12" white wire
56" yellow wire
12" bare hookup wire
6" spaghetti
48" lacing cord

Those items marked with an asterisk (*) are available individually.

458CP: An attractive gray wrinkle cabinet for the BC-458, 5½" wide, 8-3/4" high and 13" deep with silk screened front panel and all holes drilled; matches Models 10 and 20 Multiphase Exciters. Identical in size with the Sideband Slicer. Price $13.75

Model 458A-10: A crystal controlled converter to extend the BC-458 for operation from 28.4 to 29.4 mc. Fits inside the BC-458 case. (458K Kit required in addition). Wired and tested..... $39.50
Kit..... $29.50



SCHEMATIC OF CONVERTED UNIT – BC458 VFO

FIG 4

VFO-P9
458K-P15

MULTIPHASE EXCITER
MODEL 20A

INSTRUCTION MANUAL

108MXA

CENTRAL ELECTRONICS, INC.
A SUBSIDIARY OF ZENITH RADIO CORPORATION
1247 W. BELMONT AVENUE
CHICAGO 13, ILLINOIS

M210
108MXA

Printed in U.S.A.

MULTIPHASE EXCITER
MODEL 20A

INSTRUCTION MANUAL

108MXA

CENTRAL ELECTRONICS, INC.
A SUBSIDIARY OF ZENITH RADIO CORPORATION
1247 W. BELMONT AVENUE
CHICAGO 13, ILLINOIS

M210
108MXA

Printed in U.S.A.

CONDENSED OPERATING INSTRUCTIONS FOR MULTIPHASE EXCITER MODEL 20A

Connect an antenna or a linear amplifier to the 52 ohm RF output. Set bandswitch to the band desired and the VFO-Xtal switch to the proper position. Turn CARRIER knob fully clockwise. Turn OPERATION selector to MANUAL and tune the MIXER and AMPLIFIER for maximum output as shown on the RF INDICATOR, an oscilloscope or an antenna meter.

TO OPERATE SINGLE SIDEBAND

Set the MODULATION selector to one of the sideband positions (SB1 or SB2). Turn the OPERATION selector to MANUAL. With the CARRIER knob set at "0" adjust the CARRIER NULL controls A and B for minimum RF indication with the INDICATOR switch in CARRIER NULL position. Now return the INDICATOR switch to SET MAX LEVEL. Adjust the SPEECH LEVEL control between 9 and 12 o'clock, depending upon microphone gain. Talk into the microphone and you're on SSB.

When the converted BC-458 is used as a VFO, the following sideband relationship occurs:

160 Meters	SB1 Upper	SB2 Lower	
80 Meters	*SB1 Lower	SB2 Upper	3990**
40 Meters	(SB1) Upper	*SB2 Lower	7205**
20 Meters	SB1 Lower	*SB2 Upper	14290**
15 Meters	SB1 Lower	*SB2 Upper	21440**
10 Meters	*SB1 Upper	SB2 Lower	28650**

* Denotes sideband most commonly used

** Denotes frequency most commonly used

When 40 meter crystals or injection are used for 160 meter operation, SB2 will be the upper sideband and SB1 the lower.

TO OPERATE AM

Place the MODULATION selector in the AM position. Leave the CARRIER NULL knobs in the balanced-out condition. Advance the CARRIER knob until maximum output is obtained. Then reduce the CARRIER level to one half of the maximum value on the scope or to one half the maximum antenna current. Adjust the SPEECH LEVEL until the modulation peaks just reach the maximum output value on the scope. Too little or too much carrier will make the AM transmission sound distorted.

TO OPERATE PM (Narrow band phase modulation)

Turn the MODULATION selector to PM position. Leave the CARRIER NULL knobs on the balanced-out condition. Advance the CARRIER knob to nearly full output. Adjust the SPEECH LEVEL control so that the modulation peaks do not exceed the carrier.

Strap Key to 67

TO OPERATE CW

Turn the MODULATION selector to CW. Place the OPERATION selector on MANUAL. Advance the CARRIER control to nearly full output. Plug key into jack on front panel.

TO USE THE VOICE CONTROL CIRCUIT (VOX)

Connect the receiver speaker to the Exciter, as shown in the circuit diagram. The resistor across 1 and 2 on the rear terminal strip should be about two to three times the speaker voice coil impedance and rated at twice the power output. The extra contacts on 8, 9 and 10 may be used to operate an antenna relay, additional receiver silencing circuits, etc. With the OPERATION selector in VOX position, talk into the microphone and adjust the VOX sensitivity control on the rear of the chassis for proper operation.

CALIBRATION LEVEL CONTROL

When the OPERATION selector is in the CALIBRATE position, the CAL LEVEL control will vary the output of the Exciter for frequency "spotting."

INDICATOR SWITCH

In the CARRIER NULL position, the speech circuit is disabled and the RF INDICATOR operates at maximum sensitivity. The CARRIER control should always be at "0" while balancing out the carrier with CARRIER NULL knobs A and B. In the SET MAX LEVEL position, the RF INDICATOR sensitivity can be adjusted by the IND LEVEL control.

RF INDICATOR

The 6E5 RF INDICATOR shows the peak RF voltage output of the Exciter. It can be used for peaking the Mixer and Amplifier tuning controls and also to determine the proper speech level while operating SSB. To determine the maximum undistorted SSB output of the Exciter or linear amplifier, advance the CARRIER control until no further increase in output is observed. Now set the IND LEVEL control to just close the eye. Return the CARRIER CONTROL to "0" and adjust the SPEECH LEVEL until the voice peaks reach about 80% of the full carrier value.

EXTERNAL BLOCKING BIAS

In the standby position, -100 volts DC appears at terminal 7 on the rear terminal strip. If a bias supply is used for a linear amplifier the positive should be returned to this terminal of the Exciter. All positive components in the bias supply must be "floating" from ground and connected only to the positive lead.

When zero bias tubes are used, the amplifier grid return lead should be by-passed and then connected to terminal 7. A secure ground connection should be made between the Exciter, linear amplifier, linear amplifier power supply and the bias supply.

EXTERNAL BLOCKING BIAS (Cont'd)

If an antenna relay with auxiliary contacts is used, these auxiliary "make" contacts can be used to key the blocking bias by connecting them to #6 and #7 on the rear terminal strip. Proper keying sequence is required so that the antenna circuit makes before the blocking bias is removed. Refer to Rear Connections Diagram, M200.

When the auxiliary contacts on an antenna relay are not used to key the transmitter, the jumper should remain between terminals 6 and 7 on the strip.

RESISTIVE LOADING OR "SWAMPING"

When driving a linear amplifier, some resistive loading should be used at the Exciter or at the amplifier grid circuit. Non-inductive resistors should be used and may be connected to the two screw terminal output strip on the rear chassis. The amount of resistive loading required will depend upon the type of tubes used in the amplifier. Pentodes, tetrodes and zero bias triodes require only a small amount, while medium and low mu tubes will require heavier swamping for low distortion.

If the Exciter is lightly loaded, there is a possibility of the system going into self-oscillation. Resistive loading is not necessary when the Exciter is coupled to a constant load, such as a 50 to 70 ohm antenna.

MATCHING THE GRID CIRCUIT OF A LINEAR AMPLIFIER STAGE

In order to obtain a maximum transfer of RF from the Exciter to grid circuit of a linear amplifier stage, it is often necessary to tune the reactance out of the link on the grid coil. This is especially true when Multiband tuners are used. A suitable unit for this purpose is a two gang, or three gang, midget type of broadcast capacitor, about 400 mmfd. per section, with all the stators connected in parallel. This should be connected to series tune the PA grid link coil and can usually be inserted right at the PA coaxial cable connector. It is sometimes beneficial to experiment with the number of turns on the grid coil link to obtain maximum grid current.

Tuning the reactance out of the plate coil link in the Linear Amplifier in the same manner will assist in obtaining the heavy loading required for this type of service.

SUGGESTED LINEAR AMPLIFIERS

The 20A will drive tetrode and pentode tubes such as a pair of 813s, 4-125As, 4-250As, 4X250As and 4-400As to a kilowatt. Triodes such as 811As may be driven to about 400 watts up to 20 meters and 304TLs in class AB1 to about a kilowatt on 80 and 40 meters.

GROUNDED GRID LINEAR AMPLIFIERS

Grounded grid amplifiers require about five times as much driving power as the same tubes operating in conventional grid-driven circuits. The 20A will

drive grounded grid amplifiers, such as four high mu triode connected 837s, modified 1625s, or 6AG7s very well on the lower frequencies. For operation on the higher frequencies, or when high mu triode connected 813s, 803s or 703As are used, an additional driver stage is required.

PRELIMINARY ALIGNMENT INSTRUCTIONS

THE FOLLOWING IS RECOMMENDED FOR UNITS CONSTRUCTED FROM KITS

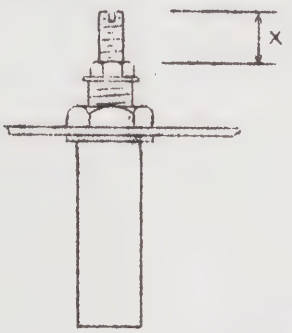
Check for "B" shorts with an ohmmeter before power is applied.

Before plate voltage is applied, the 6AG7 grid bias should be checked. This should be done by removing the 5U4G rectifier tube. With the relay in the normal position, the reading at Pin #4 of the 6AG7 should be minus 100V DC plus or minus 10% measured with a VTVM. When the relay is operated by hand, there should be approximately minus 11V DC at this point. After the 5U4G is inserted, the operating bias should be minus 10.5V DC obtained from the voltage divider R47 and R48.

Insert the 5U4G rectifier and apply power. Check "B" voltages in accordance with the chart on the circuit diagram, with the OPERATION switch on MANUAL.

Preliminary rough alignment of the slug tuned coils: If a grid dipper is available the coils should be aligned to the frequencies indicated on the Alignment Data Chart (Fig, B). If no dipper is available they should be set as follows BEFORE POWER IS APPLIED:

No. 1	Red	1/2"
No. 2	Green	1/8"
No. 3	White	1/4" to 3/8"
No. 4	Black	3/8"
No. 5	Blue	3/8"
No. 6	Orange	1/2"
No. 7	Yellow	1/2"
No. 8	Blue	1/4" (Not used on Model 10B)



The Audio Balance controls should be set in approximately mid-position.

During alignment, a slight amount of tension should be kept on the adjusting screws by proper adjustment of the locking nut to prevent erratic operation. After alignment, be sure to tighten the nuts, taking care not to upset the adjustment, especially on the Green coil, L2.

M211

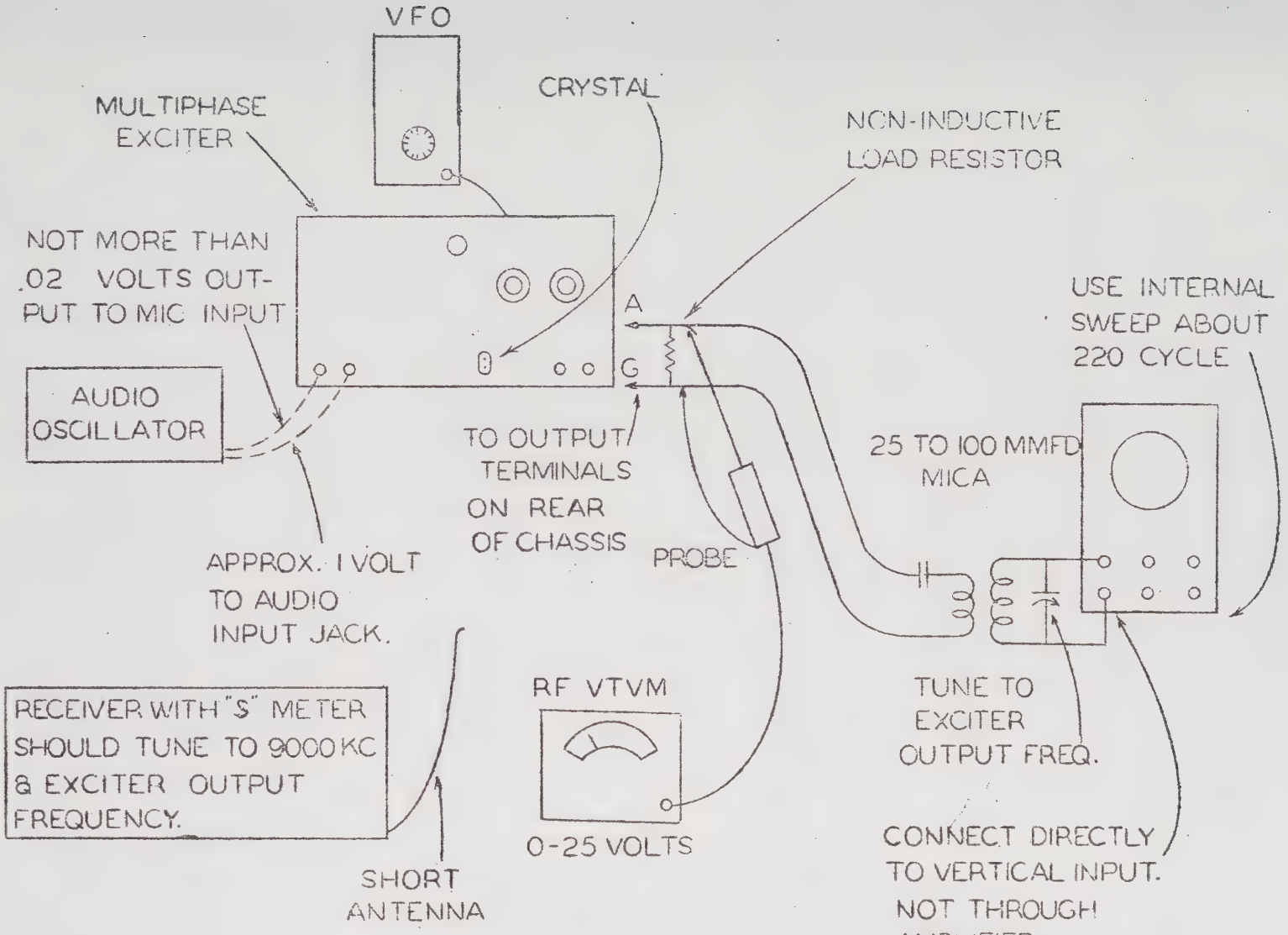

VFO
CRYSTAL
MULTIPHASE EXCITER
NON-INDUCTIVE LOAD RESISTOR
NOT MORE THAN .02 VOLTS OUT-PUT TO MIC INPUT
A
G
USE INTERNAL SWEEP ABOUT 220 CYCLE
AUDIO OSCILLATOR
TO OUTPUT TERMINALS ON REAR OF CHASSIS
25 TO 100 MMFD MICA
APPROX. 1 VOLT TO AUDIO INPUT JACK.
PROBE
RECEIVER WITH "S" METER SHOULD TUNE TO 9000 KC & EXCITER OUTPUT FREQUENCY.
RF VTVM
TUNE TO EXCITER OUTPUT FREQ.
0-25 VOLTS
SHORT ANTENNA
CONNECT DIRECTLY TO VERTICAL INPUT. NOT THROUGH AMPLIFIER

FIG. A

20A GENERAL ALIGNMENT PROCEDURE

SEE CHART FOR ALIGNMENT LOCATIONS

The front panel controls should be set as follows:

OPERATION SWITCH, in MANUAL
SPEECH LEVEL, completely counter-clockwise
MODULATION SWITCH, Sideband 1
CARRIER NULL A, middle position
CARRIER NULL B, middle position
CARRIER, completely counter-clockwise
VFO-XTAL SWITCH, in correct position
INDICATOR SWITCH, on SET MAX LEVEL
INDICATOR LEVEL, completely clockwise
BANDSWITCH, to proper band
TUNING CONTROLS, to output frequency

Refer to Fig. A. Connect a non-inductive load resistor of about 50 ohms, 20 watts to the Exciter output terminals. This resistive load may consist of one or two watt composition resistors in parallel or series-parallel to provide the proper resistance and dissipation.

Connect an oscilloscope, lightly coupled, to the RF output.

If available, an RF vacuum tube voltmeter with a 25 to 50 volt RMS range can be used to measure the RF output.

CAUTION! Never remove the 9000 kc. crystal from the socket while the 6U8 tube is operating. This may damage the tube.

Tune L1 and L2 for maximum RF voltage measured between the arm of Null Pot B and ground. An RF VTVM is required. Measure the RF voltage at the arms of Null Pots A and B. Adjust spacing between L1 and L2 to obtain equal voltage. As spacing is varied it will be necessary to repeak L1 and L2 for maximum. Normal voltage is between 5 and 6 volts peak. Multiply by .707 for RMS reading.

Advance the CARRIER control to about 7.

At this time it should be possible to hear a signal on the output frequency with the receiver operating near full sensitivity (AVC on) provided the VFO or frequency conversion crystal is operating. The receiver should be coupled lightly to the Exciter RF output terminal. Refer to Fig. B. Adjust L3, L4, L5 and the MIXER AND AMPLIFIER tuning capacitors for maximum output. As maximum output is reached, it will become necessary to reduce the carrier output by adjusting CARRIER pot and also reduce the sensitivity of the RF INDICATOR by turning the IND. LEVEL control counter-clockwise to prevent the eye from overlapping. Next, insert small amount of CARRIER and peak L3 through L5 again. Now turn CARRIER control off (counter-clockwise) and adjust both CARRIER NULL controls for minimum output. Minimum output will not necessarily occur at the center of the rotation due to stray capacities, etc. Loosen knobs and reset to reference marks with carrier nulled out.

ADJUSTMENT OF 15 MC TRAP L6 (CRANGE)

When operating on the 20 meter band, this trap circuit will reduce radiation of the third harmonic generated in the mixer by the heterodyning crystal or VFO operating in the vicinity of 5 MC. With the bandswitch set to 20 meters, the SPEECH LEVEL turned off, carrier balanced out or 9 MC master oscillator tube removed, and the OPERATION switch in the MANUAL position, RF output will be found when the Mixer and Amplifier tuning controls are resonated at approximately 15 MC. Adjust slug in trap L6 for minimum 15 MC. output.

ADJUSTMENT OF L7 (YELLOW) TRAP

This trap is tuned to 13 MC or 15 MC, depending upon the age of the unit and whether modification "C" has been made. Modification "C" adds a 180 ohm resistor, bypassed with a .005 capacitor, to the cathode of the 6BA7 Mixer. The Yellow trap coil is removed to the Mixer plate circuit and is tuned to 13 MC. For details refer to Change Notice #M170. If the change has been made, adjust L7 to 13 MC by any one of the three following methods:

1. Use a grid dipper.

2. If no dipper is available, a 6.5 MC crystal can be used in the socket on the front panel, with the VFO-XTAL switch in the XTAL position. With the bandswitch in the 20 meter position, OPERATION switch in MANUAL, carrier balanced out (or 9 MC master oscillator tube removed) and the TUNING controls peaked for maximum 13 MC output, L7 should be adjusted for minimum 13 MC signal.

3. The receiver S meter can also be used as an indicator. It should be tuned to the 13 MC signal, or to 26 MC for Collins receivers. With this method the 9 MC master oscillator tube must be operating with full carrier insertion and 5 MC injection from a crystal or VFO.

The VFO output should be advanced to the point where additional coupling will not increase the exciter output. Over-injection to the Mixer can cause unnecessary spurious radiation.

ADJUSTMENT OF 5 MC TRAP, L8

Blue coil near the right edge of the chassis. Set the bandswitch to 80 meters. With either a 5 MC crystal plugged into the socket on the front panel or 5 MC VFO insertion, adjust the Mixer and Amplifier tuning controls for maximum 5 MC output. This will occur slightly lower in frequency than the 7 MC dial calibration. Adjust L8 for minimum output.

ADJUSTMENT OF C81, C82, C83, C84

These four trimmers appear on a strip at the right of the bandswitching assembly, just below the 12BH7 tube. They tune the cathode coils on 10, 15, 20 and 40 meters, respectively. The 10 meter trimmer is the one closest to the chassis; the second one is 15 meters, etc. They should be peaked for maximum output in the center of their band with a small amount of CARRIER inserted.

SIDEBAND SUPPRESSION ADJUSTMENT

Before proceeding with the single sideband adjustments, it is recommended that the operator familiarize himself with the illustrations of the oscilloscope patterns shown in this manual. The ultimate objective in the single sideband alignment is to obtain a pattern containing a minimum amount of ripple when a pure sine wave is applied to the microphone input. These adjustments should preferably be made at less than full output, to prevent amplifier overloading, which might "wipe off" the small modulation ripple.

A low distortion audio oscillator (less than 1%) set to approx. 1,225 cycles, with an output level between .005 and .02 volts should be connected to the microphone jack. CAUTION: If a voltage in excess of .02 is applied to the mic input the speech amplifier will overload and it will be impossible to adjust the Exciter properly. It will be impossible to make the sideband adjustments if the audio oscillator has more than 1% distortion.

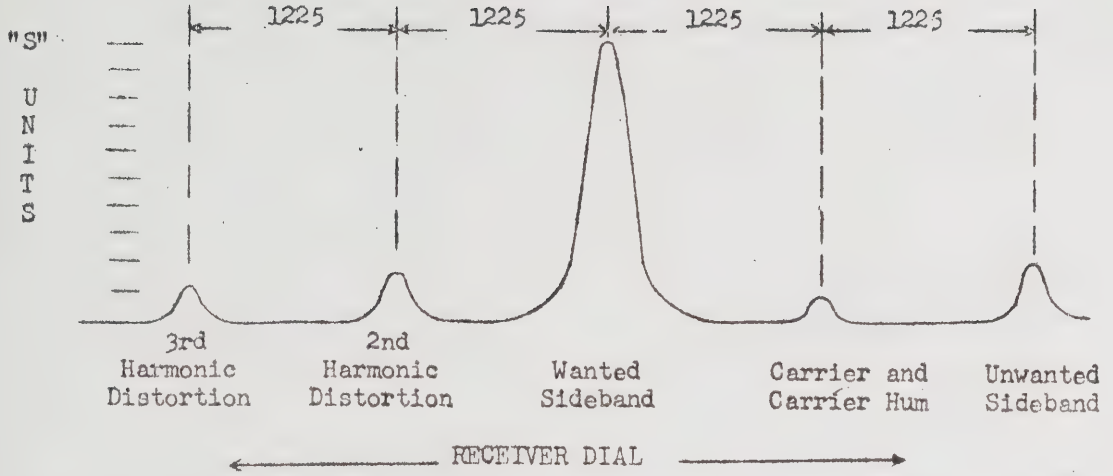
Adjust both CARRIER NULL pots for minimum carrier output. Advance the SPEECH LEVEL control until about half of maximum output is obtained on the oscilloscope. At this point a fair amount of ripple will be observed on the output wave. Adjust the Audio Balance controls for minimum ripple. Now switch from sideband 1 to sideband 2 and observe the ripple in each. If the amount of ripple is not equal, vary the adjustment slightly on L2 until the displays are identical in either sideband position. However, each time L2 is tuned it will be necessary to rebalance both carrier null controls for minimum. It will also be necessary to readjust the Audio Balance controls again. In most cases this procedure must be repeated until good suppression is obtained.

After the alignment has been completed, an analysis of the emitted wave may be made if the receiver has a sharp crystal filter and a calibrated "S" meter. The following illustration is an example of the "S" meter levels as the receiver dial is tuned through the signal with a 1225 cycle tone input to the Exciter.

In order to obtain proper sideband suppression, the RF voltages at the arms of the CARRIER NULL pots must be essentially equal when the carrier is balanced out. With tone input, the audio voltages at the by-passed ends of the Red and Green links must be approximately equal with the Modulation switch in one of the SB positions.

Poor sideband suppression may be caused by:

Defective 12AT7 modulator tube.
Defective phase shift network.
Open or partially shorted 27A0-79 modulation transformer.
Secondary of audio driver transformer 27AM-24 shorted to ground, master crystal oscillating on two adjacent frequencies simultaneously.
I2 seriously misaligned, defective coil or capacitor. Check with a dipper for resonance.



It is possible to obtain an almost ripple-free pattern in one sideband at the expense of degradation of the other. Under this condition the suppression of the better sideband will be about 45 db., while the other is only 35 db. down. The object is to have them both equal, approximately 40 db. down.

If a deep modulation ripple is noticed on both sideband positions (with carrier balanced out), one side of the audio phase shift circuit is probably operating improperly. Check the Audio Balance controls adjustment, the 12AT7 (B) modulator tube, sideband switching circuit, or the phase shift network.

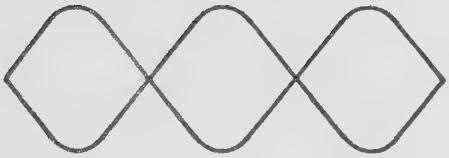
After the alignment has been completed, be sure to tighten the #6 lock-nuts on the iron core slugs.

Good SSB Signal
Pure Tone Input

SSB Signal, Tone Input
Poor Sideband Suppression

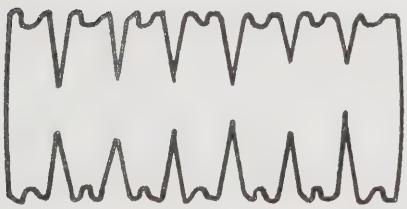
1. Improper RF phasing (L2)
2. Improper AF balance (R18-15A)
3. Balanced Mod detuned (L3)

5-26-55 Rev. 12-1-58
Alignment 10-20A
Printed in USA



SSB SIGNAL, TONE INPUT
WITH PROPER CARRIER INSERTED
100% MODULATED

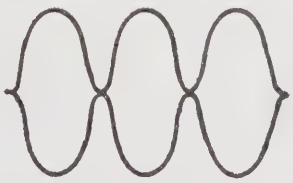
SSB SIGNAL, TONE INPUT
AUDIO DISTORTION
EXCESSIVE AUDIO INPUT
EXCESSIVE DISTORTION IN
AUDIO OSCILLATOR



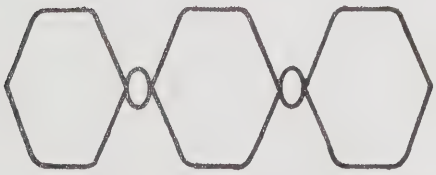
SSB SIGNAL, TONE INPUT
INSUFFICIENT 9000 kc. XTAL
OSCILLATOR OUTPUT

GOOD SSB SIGNAL, TONE
INPUT WITH SMALL PER-
CENT OF SPURIOUS RADIA-
TION (RF)

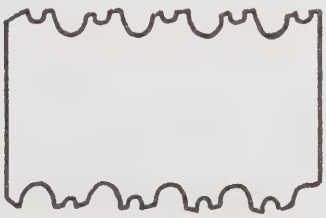
GOOD SSB SIGNAL, TONE INPUT
WITH LARGE PERCENT OF
SPURIOUS RF RADIATION



SSB WITH CARRIER, TONE
INPUT IMPROPER AMPLIFIER
BIAS



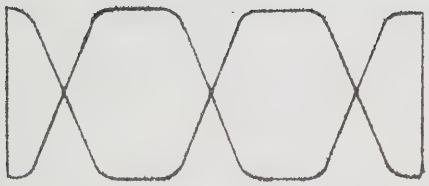
DOUBLE SIDEBAND WITH CARRIER
EXCESSIVE TONE MODULATION
WITH AUDIO PEAKS SQUARING OFF



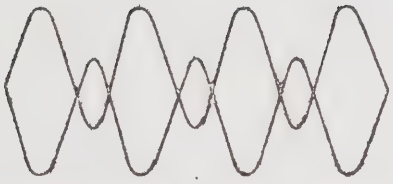
SSB SIGNAL, TONE INPUT
BALANCED MOD DETUNED (L3)

M68A-108-9MX
2/22/60
Alignment of 10-20

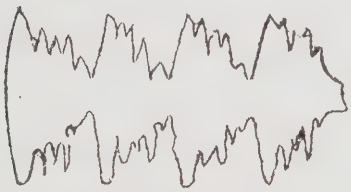
P230A
108 MXA
109 MX



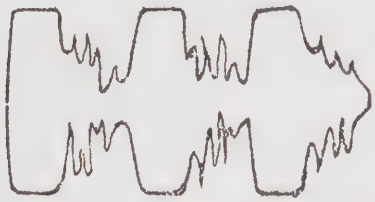
SSB WITH CARRIER, TONE INPUT.
1. EXCESSIVE AUDIO SIGNAL
2. INSUFFICIENT ANT. LOADING



DSRC DOUBLE SIDEBAND REDUCED CARRIER OBTAINED BY REDUCING CARRIER LEVEL AND INCREASING AUDIO INPUT LEVEL.

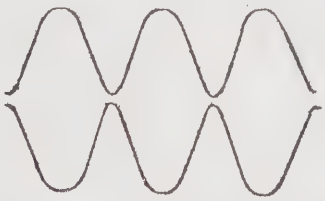


GOOD SSB SIGNAL VOICE INPUT

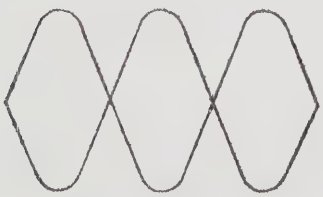


SSB SIGNAL, VOICE INPUT. SQUARING AUDIO PEAKS. EXCESSIVE SPEECH GAIN

SSB SIGNAL, TONE INPUT AMPLIFIER OVERLOADING DUE TO EXCESSIVE AF OR RF DRIVE . NOTE THE LACK OF SMALL RIPPLE ON ENVELOPE



DOUBLE SIDEBAND AM WITH CARRIER 100% MODULATED



TWO TONE LINEARITY TEST OBTAINED WITH SINGLE TONE INPUT, WITH CARRIER BALANCED OUT ON AM

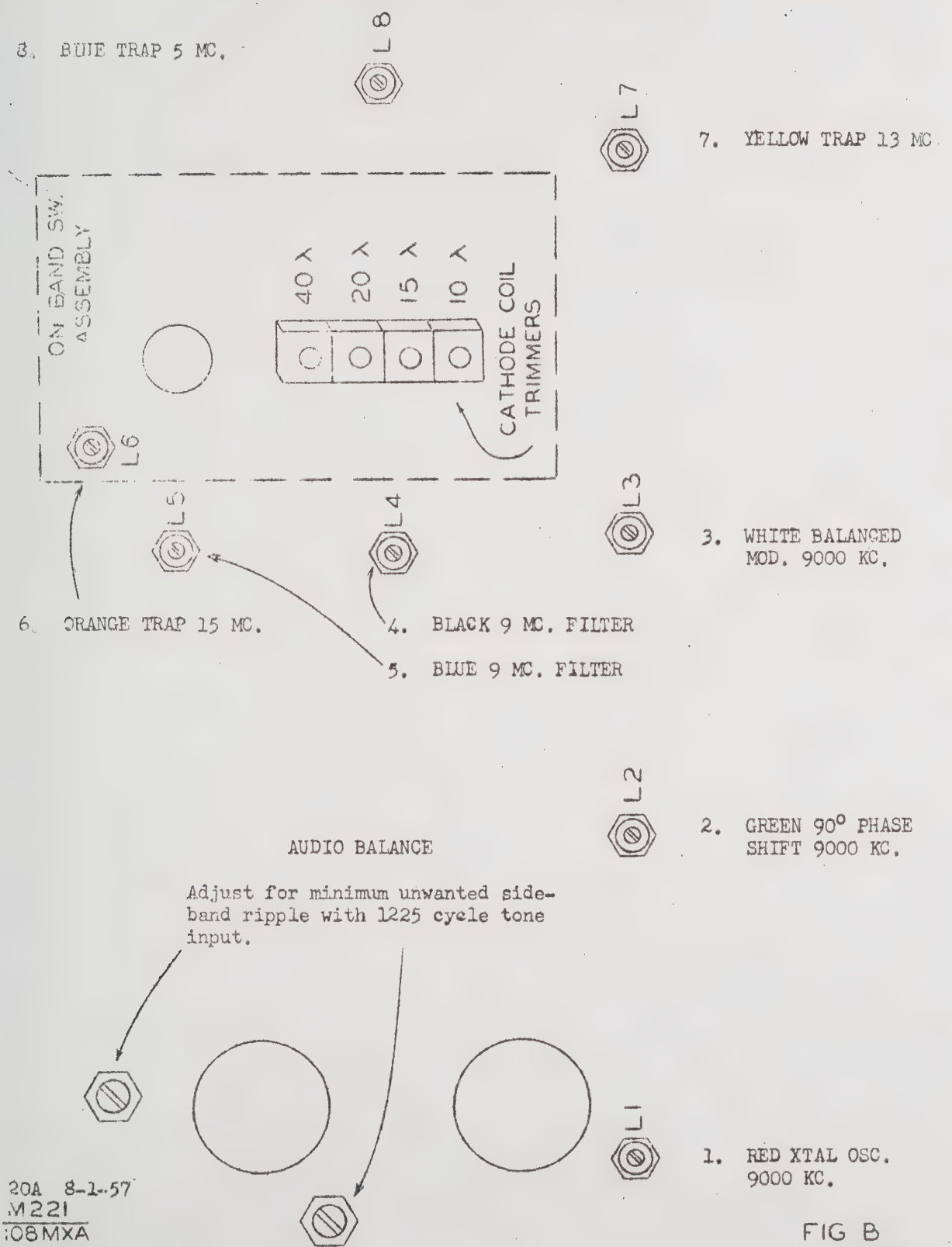
FOR ADDITIONAL REFERENNCE THE FOLLOWING IS RECOMMENDED:

SUGAR COATED LINEAR AMPLIFIER THEORY - OCTOBER '51 QST

HOW TO TEST AND ALIGN A LINEAR AMPLIFIER - MAY '52 QST

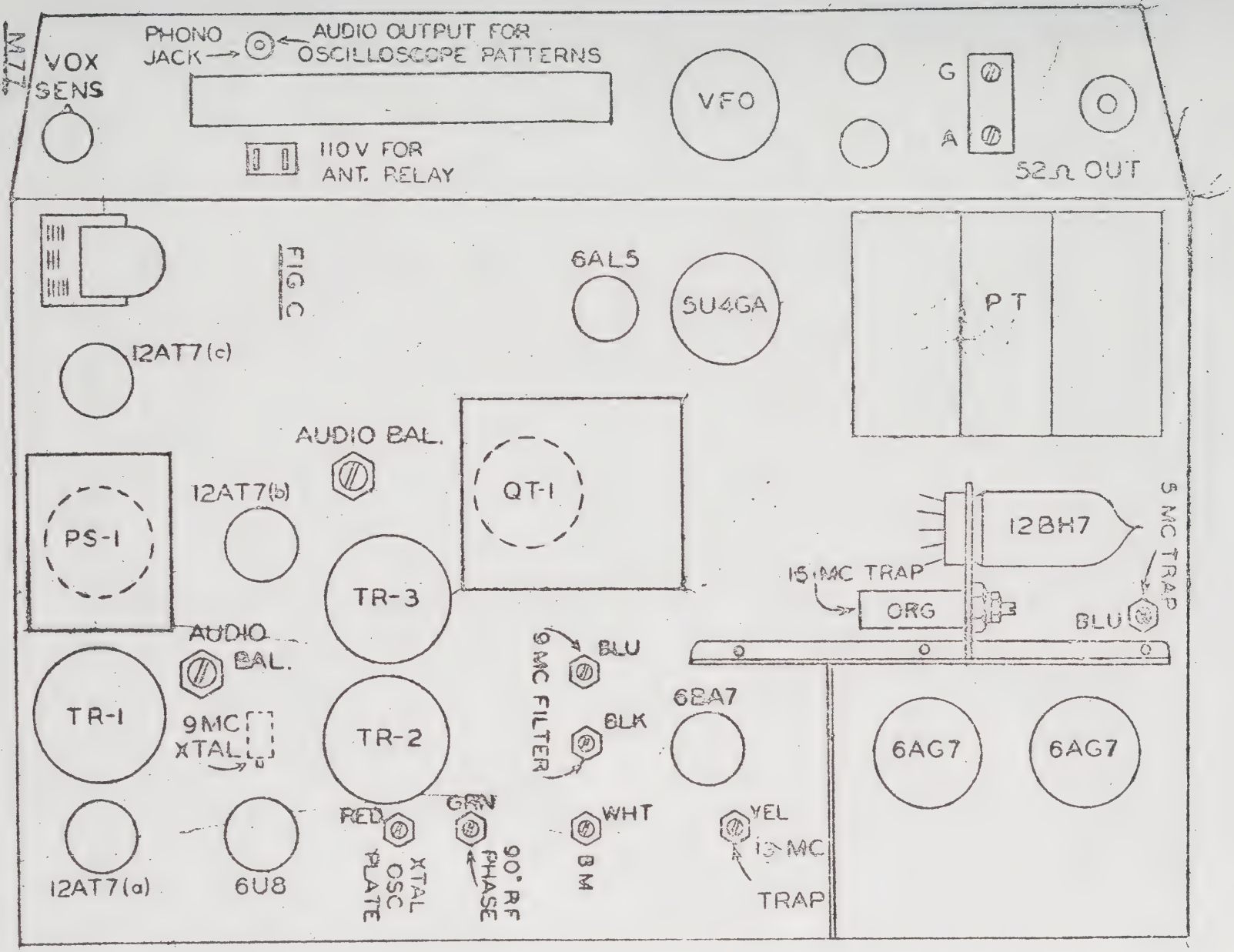
Alignment 20 - 10
6-12-56
Printed in USA

FIGURE B LOCATION CHART
ASSIGNMENT FOR MULTIPHASE EXCITER MODEL 20A
REFER TO PAGES 5 THRU 7 FOR PROCEDURE



20A 8-1-57
M221
108MXA

FIG B


VOX SENS
PHONO JACK
AUDIO OUTPUT FOR OSCILLOSCOPE PATTERNS
110 V FOR ANT. RELAY
VFO
G
A
52Ω OUT
FIG C
6AL5
5U4GA
PT
12AT7(c)
AUDIO BAL.
QT-1
12AT7(b)
PS-1
TR-3
12BH7
5 MC TRAP
15 MC TRAP
ORG
BLU
AUDIO BAL.
TR-1
9MC XTAL
TR-2
6 MC FILTER
BLU
BLK
6BA7
6AG7
6AG7
12AT7(a)
6U8
RED
GRN
WHT
YEL
XTAL OSC PLATE
90° RF PHASE
BM
15 MC TRAP

MULTIBAND OPERATION

The frequency conversion method used permits all band operation without affecting the single sideband adjustments. In the Multiphase Exciter a master 9000 KC crystal oscillator furnishes RF power to a pair of germanium diode balanced modulators, where the sidebands are produced. The modulator output is then applied to a low level mixer stage where it is heterodyned to the desired output frequency by a crystal or an external VFO. For example, a crystal, or a BC-457 (4 to 5.3 MC) or BC-458 (5.3 to 7 MC) command transmitter operating from a VR75, will provide output in the 20 to 75 meter phone bands.

A BC-458 can be modified to provide band switched VFO injection for operation from 160 through 10 meters with excellent stability.

The VFO socket on the rear of the exciter furnishes plate voltage for this purpose.

Complete instructions are furnished for Command unit modifications.

Central Electronics has made available kits for the BC-458 which contain all the necessary conversion parts. The 458K covers 160 through 15 meters and the 458-10 is the ten meter conversion kit. Factory modified 458s are also available, 160 through 15 meters and 160 thru 10 meters.

The following chart indicates the injection frequencies required with the 9 mc. master oscillator

OUTPUT FREQUENCY	INJECTION FREQUENCY
1800 kc.	7200 kc.* or 10800 kc.
2000 kc.	7000 kc.* or 11000 kc.
3500 kc.	5500 kc.* or 12500 kc.
3800 kc.	5200 kc.* or 12800 kc.
4000 kc.	5000 kc.* or 13000 kc.
7000 kc.	16000 kc. or 5333.3 kc. x 3
7200 kc.	16200 kc. or 5400 kc. x 3
7300 kc.	16300 kc. or 5433.3 kc. x 3
14000 kc.	5000 kc.* or 23000 kc.
14200 kc.	5200 kc.* or 23200 kc.
14300 kc.	5300 kc.* or 23300 kc.
21000 kc.	12000 kc.* or 30000 kc.
21450 kc.	12450 kc.* or 30450 kc.
28000 kc.	37000 kc.
28500 kc.	37500 kc.
29700 kc.	38700 kc.

*Injection at these frequencies may be obtained from crystals plugged into the front panel socket.

108MX 20A
10-21-58
Printed in USA

160 meter crystals or injection should not be used for 40 meter operation. For example, when using 1800 kc. injection (9000 - 1800 = 7200) the fourth harmonic of the injection frequency will also be present in the mixer output. This fourth harmonic (1800 x 4 = 7200) will be further amplified by the 6AG7 stage and result in a strong spurious signal.

The same holds true if 19 MC injection is used for 28 MC operation. In this case the second harmonic is 38 MC and 38 - 9 = 29 MC. As a result there will be a spurious signal radiated which is about 30 db. below the desired one. Therefore only 37 MC should be used for 10 meter operation.

NOVICE OR C.W. OPERATION ONLY

Break-in CW may be used on the 160, 80, 40 and 20 meter bands with direct frequency crystals. Turn the Modulation selector to the CW position. Plug the crystals into the socket on the front panel and tune the Mixer and Amplifier to frequency.

THEORY OF OPERATION

Refer to the Block Diagram, Fig. A1.

SPEECH AMPLIFIER

Both sections of a 12AT7 tube are used as a speech preamplifier. A closed circuit jack is connected in series with the grid of the second stage for external AF input and may be used for a phone patch, audio oscillator input, etc. Maximum input to the jack should be less than 1.2 volts rms.

VOICE AMPLIFIER

An additional stage of amplification consisting of one section of a 12AT7 further amplifies the speech. The VOX SENSITIVITY control located on the rear of the chassis, controls the input to this stage and the sensitivity of the VOX system. A 470K resistor in series with the grid prevents any grid rectification from reflecting distortion back into the speech system.

VOICE RECTIFIER

One section of a 6AL5 rectifies the output of the voice amplifier. R40 and C40 determine the VOX time constant. The rectified voltage is positive at this point.

RELAY CONTROL

The other section of the 12AT7 Voice Amp tube is used to operate the VOX relay. The cathode resistor, R45, permits a residual current of about 2 ma. through the relay, which will attract at about 3-1/2 to 4 ma. Therefore any small positive voltage from the Voice rectifier will trip the relay. R40A, 1 megohm, prevents excessive positive grid current from damaging the tube.

RELAY CONTROL (Cont'd)

Section 2 of the Operation Selector switch connects the grid of the tube to the positive output of the Voice Rectifier for VOX operation, or to a voltage divider for MANUAL operation. The divider consists of R42 and R43, which is connected across the B plus 300 volts and ground. The divider furnishes about 30 volts positive (through a 1 meg. current limiting resistor) to the grid of the Relay Control Tube. When an open key is inserted in the KEY jack, 30 volts negative appears at the junction of R42 and R43. When the key is closed, the voltage at the junction returns to positive 30. The application of the negative voltage while the key is open provides faster relay release for high speed keying.

QT-1 CIRCUIT

The QT-1 is a plug in unit for use with Multiphase Exciters, to prevent operation of the voice control circuit by the loudspeaker. With this unit, the voltage appearing across the loudspeaker voice coil is amplified, rectified and applied in negative polarity to the grid of the relay control tube. The loudspeaker will develop two opposing voltages at the grid of the relay tube, a positive voltage from the microphone channel and a negative voltage from the speaker voice coil. When these two voltages are correctly proportioned, the loudspeaker will not trip the relay.

AF DRIVER

The triode section of a 6U8 and transformer TR-1 serves as a low impedance driver to the audio phase shift network. The input voltage divider to the PS-1 is about 400 ohms on one side and 1400 on the other. Therefore the voltage applied to one side is .285 of that applied to the other side. R15A, the Audio Balance potentiometer, permits exact balance of the input voltage.

AUDIO PHASE SHIFT NETWORK

The PS-1 is a precision 90 degree differential phase shift network consisting of two independent circuits. The output of each circuit is applied to the grid of a modulator tube. Phase shift between the two output terminals is 90 degrees plus or minus 1.3 degrees over the essential speech range. Although the input voltages to the PS-1 are .285 to 1, the output voltages are equal. The trimmer capacitors are laboratory adjusted and readjustment should never be attempted in the field.

MODULATOR

Each section of the 12AT7 serves as an independent modulator, furnishing equal 90 degree displaced audio voltages at low impedance to the Balanced Modulator, through transformers TR-2 and TR-3. The cathode of one section of the tube has an adjustable resistor, R18, to obtain equal modulator outputs.

MODULATION SWITCH

In SB1 position, both modulation transformers feed the balanced modulator. In SB2, the white and brown leads from the secondary of TR2 are reversed, which reverses the sideband. In AM, the secondary of TR-3 is opened to disable one

MODULATOR SWITCH (cont'd)

of the modulators and the "cold" end of the Green link is returned to ground through a 15 ohm resistor. This resistor is approximately the same resistance as the secondary of the transformer and is inserted to prevent unbalance of the modulator circuit. In PM, TR-3 is restored to the circuit, the secondary of TR-2 is opened and the "cold" end of the Red link is returned to ground through a 15 ohm resistor. In the CW position, the secondaries of both modulation transformers are opened and both links are returned to ground through 15 ohm resistors.

MASTER OSCILLATOR

The control grid and screen grid in the pentode section of the 6U8 are utilized as a crystal controlled Pierce oscillator, with the electron coupled plate circuit tuned to 9 mc. Inductive coupling between L1 and L2 provides the required 90 degrees RF phase shift.

BALANCED MODULATOR (Refer to Fig. A2)

Basically, the phasing method of single sideband generation consists of two independent audio frequency phase shift systems, two sources of RF shifted 90 degrees in phase and two balanced modulators. Each balanced modulator produces a double sideband signal, with the carrier cancelled out. When these modulator outputs are combined, single sideband will be produced, provided the phase shifts are proper and the voltages equal. In actual practice, only one RF source is required and one common tank circuit is used for the balanced modulators. Referring to the basic diagram, if the carrier is unbalanced the proper amount in Channel A and modulator B is disabled, normal AM will be produced. If the carrier in channel A is completely unbalanced and modulator A is disabled, modulator B will furnish RF sidebands displaced 90 degrees from the carrier, which combine with the carrier to produce phase modulation. Phase modulation generated by this method provides a modulation index of 1, which has the same bandwidth as amplitude modulation and is the maximum deviation permitted in the amateur bands below 29 mc.

9 MC. TUNED CIRCUITS

L4 and L5 are critically coupled 9 mc. tuned circuits which prevent strong harmonics present in the balanced modulator from reaching the grid of the mixer tube.

MIXER

The 9 mc. signal is applied to the control grid of the 6U8 mixer and the external VFO is fed to the injection grid. For front panel crystal control, the VFO-XTAL switch changes the injection grid and screen grid to a Pierce oscillator circuit. The plate circuit of the Mixer stage is series fed and the plate voltage appears on these coils. The output is capacitively coupled to the cathode follower.

13 and 15 MC. TRAP COILS

Mixers, being non-linear devices, also generate strong harmonics. When operating on 20 meters it is necessary to trap out two undesirable components. The 5 mc. injection frequency will give output at 15 mc., while the second harmonic (18 mc.) of the generating system combines with the 5 mc. VFO to produce 13 mc. L6 and L7 are used to reduce the level of these components.

CATHODE FOLLOWER

On 160 and 80 meters, an RF choke is used in the 12BH7 cathode output circuit. On the higher frequency bands individual tuned circuits are required to furnish adequate driving power for the amplifier and further discriminate against undesirable products.

LINEAR AMPLIFIER

The grid of the parallel 6AG7 linear amplifier is capacitively coupled to the cathode follower stage. Trap L8 is inserted in series with the grids to reduce the level of the 5 mc. injection frequency when operating at 4 mc. The plate circuit is shunt fed and the 50 ohm output taps are made directly to the coil on 160, 80 and 40 meters. A tapped inductively coupled link is used on the higher frequencies.

INDICATOR RECTIFIER

One section of the 12BH7 is coupled to the 50 ohm RF output to function as a rectifier to furnish the negative DC voltage to operate the 6E5 RF INDICATOR.

INDICATOR SWITCH

In the CARRIER NULL position, the full output of the Indicator Rectifier is applied to the 6E5 for maximum sensitivity and the speech circuit is disabled to prevent room noise from operating the eye. In the SET MAX LEVEL position the RF INDICATOR sensitivity is adjustable by means of the INDICATOR LEVEL potentiometer.

CALIBRATION LEVEL

With the OPERATION switch in the CALIBRATE position, the bias on the Mixer and Amplifier grids is varied from normal to negative 40 volts for frequency spotting with the CAL LEVEL potentiometer. In this switch position, negative 100 volts still remains on #7 on the rear terminal strip to keep the final amplifier biased to cut-off, to prevent excessive radiation.

KEYING CIRCUIT

In standby, negative 100 volts is applied to the grids of the Mixer and Amplifier stages. This voltage also appears at the rear strip, terminal #7, for block biasing any external linear amplifier. In transmit, this voltage is shorted to ground by the internal relay with the switch in the MANUAL or VOX position. There are two methods for "silent"CW operation, to avoid relay noise. With the

KEYING CIRCUIT (Cont'd)

OPERATION SWITCH in the STANDBY position, the key connected to 7 and 5 (ground), the blocking bias will be shorted out when the key is closed. The receiver will not be muted; a TR switch, separate receiving antenna or manually operated antenna switch must be used. If the key is placed in series with terminals 6 and 7, the relays will close in the MANUAL position and the key will short our the blocking bias. Normal VOX operation may be resumed by closing the switch on the key.

BIAS RECTIFIER

One section of a 6AL5 is used as a half wave rectifier to supply negative 100 volts for blocking bias, and operating bias for the 6AG7s.

ACCESSORY POWER SOCKET

This is the octal socket located on the rear of the chassis and furnishes 6.3 volts AC and 300 volts DC for VFO operation.

PHONE JACK

When the speaker is connected as shown in the diagrams, inserting the phone plug will disconnect the loudspeaker. The phones will be controlled by the VOX circuit.

CAUTION!!

ON FACTORY BUILT EXCITERS, DO NOT ADJUST THE SLUG TUNED COILS UNLESS ABSOLUTELY NECESSARY. EXPERIENCE HAS PROVEN THAT IMPROPER OPERATION DUE TO MISALIGNMENT IS VERY RARE. WHEN THE POWER IS ON, DO NOT REMOVE THE 9 MC. CRYSTAL WHILE THE 6U8 TUBE IS IN ITS SOCKET. LOSS OF RF EXCITATION WILL RESULT IN EXCESSIVE PLATE DISSIPATION AND POSSIBLE DAMAGE TO THE TUBE.

TUBE REPLACEMENT

Use only RCA type 6AG7. Other versions of this tube are unusually subject to interelectrode shorts. Avoid old war surplus 6AG7s; many of these will oscillate vigorously.

A blue haze may be observed near the bottom of the envelope on most 6U8 tubes as operated in this equipment. This is normal and is due to electron bombardment of the glass. In gassy tubes the blue haze occurs between the tube elements.

Erratic operation of the voice control relay is usually due to a weak relay control tube 12AT7(C) or a tube with unusual characteristics.

Lack of sideband suppression may be due to a defective modulator tube 12AT7(B). Be sure that both filaments are lighted.

REPLACING SHORTED TUBES

Shorted tubes will often damage associated plate and cathode resistors even though the short has been of an intermittent nature. If abnormal or intermittent operation occurs after replacing a shorted tube, the resistors should be checked with an ohmmeter if possible, or observed visually for discoloration. In some instances it is possible to observe sparking in a severely damaged resistor under subdued light, or it may fall apart under slight pressure from an insulated tool.

Whenever a shorted 6U8 is replaced, R20 and R21A should be checked. Inadvertent shorts in the 6BA7 mixer plate or plate coil assembly will usually damage R67, located on a small terminal strip on the rear of the Mixer tuning capacitor.

INTERMITTENT OR NO RF OUTPUT ON ONE OR MORE BANDS

The two rotor end plates of the Mixer and Amplifier tuning capacitors should be checked for shorts. When necessary, bend the end plates away from the stator slightly to provide sufficient clearance.

MODULATION LOW OR ABSENT

This is often caused by a defective microphone or broken leads at the microphone connector. If another microphone is not available for test, press the

male mike connector pin with your finger. On an exciter that is correctly tuned and otherwise operating properly, sufficient signal will be provided to make the eye overlap at full Speech and Indicator sensitivity.

VOICE CONTROL RELAY OPERATION

The relay is designed to attract at approximately 4 ma. and release at 2-1/2 to 3 ma. In cases where the relay lacks sensitivity, R45 should be decreased to 2500 ohms. If it does not release readily, R45 should be increased to 3000 ohms. Any departure from these values usually indicates shorted turns in the relay coil, or possibly high leakage or a short from the coil to the frame.

CALIBRATE SIGNAL WEAK

Under some circumstances, when a well shielded linear amplifier and a coaxial relay are used, the calibrate signal will be weak. It will be necessary to couple some of the exciter output into the receiver. Coaxial cable should be used and two insulated wires twisted together for about four inches will furnish sufficient coupling when connected at the exciter two lug terminal strip. A coaxial T connector should be used at the receiver.

CARRIER DOES NOT BALANCE OUT PROPERLY

When operating on the 3.9 mc. phone band, be sure that the pointers on the Mixer and Amplifier tuning controls are within about 1/8 inch of the panel marking. It is possible to "tune up" on the output of the 5 mc. crystal or VFO when the pointers are in the vicinity of 7.2 mc. The 5 mc. carrier cannot be cancelled with the carrier balance potentiometers and this effect is often mistaken for oscillation or lack of carrier balance. On 40 meters it is possible to tune to the 9 mc. generating system with the dial pointers at 14 mc. Reasonable care should be taken when tuning to make sure that the pointers are close to the desired operating frequency.

RFC-1 may be open. Remove the plug-in diode assembly. The resistance of the choke should be about 30 ohms. If the choke is not open, the diodes should be checked with an ohmmeter. Each diode should be within about 10% of the average value in the forward direction. The back resistance should be at least 100 times as great and this ratio is unimportant.

SIDEBAND SUPPRESSION

In order to obtain good sideband suppression, the RF voltages applied to the balanced modulator must be within 10% of each other, when L1 and L2 are peaked. If the difference is greater it will be necessary to adjust the position of L1 until they are more equal. This may be measured conveniently at the arm of each carrier null pot, with the carrier balanced out and should be between 3.2V and 4.2V rms, or 4-1/2 to 6V Peak.

The audio voltages must also be equal and these appear at the red and green wires at the bottom of the Modulation switch. The Modulation switch must be in one of the sideband positions for this measurement, with an audio signal

of 1225 cycles to the exciter input. A 1000 ohm per volt rectifier type AC meter is satisfactory for purposes of comparison. If the voltages cannot be balanced by means of the audio balance controls R15A and R18, one of the components on the side that has the lowest reading is usually at fault. This may be caused by a defective modulator tube, open or shorted turns on the modulation transformer, driver transformer secondary shorted to ground, open contact on Modulation switch, etc.

With the power turned off, the PS-1 can be checked while in its socket for trimmer shorts. NEVER attempt adjustment of the trimmer capacitors in the PS-1. The components used are extremely stable, are operated at very low voltage and will maintain their accuracy indefinitely.

Note that the input voltage divider to the PS-1 is about 400 ohms on one side and 1400 ohms on the other. Therefore the voltage applied to one side is .285 of that applied to the other side. The output voltages of the phase shift network are equal.

Common errors in units constructed from kits which cause poor sideband suppression are:

1. 400 and 1400 (or 1430) ohm resistors reversed.
2. PS-1 socket wired incorrectly. Remember this is a 9 pin socket.
3. Poorly soldered connection at the 2 lug terminal strip TQ, located under the chassis near the Modulation switch. This is at the junction of the two Green wires and the .001 capacitor.

SIDEBAND SUPPRESSION ALIGNMENT WITHOUT THE USE OF A SCOPE

In an emergency, it is possible to adjust the sideband suppression using an audio oscillator and a receiver.

The receiving antenna should be removed, the BFO turned OFF and the AVC ON. Tune in the signal on the receiver.

Remember that with sine wave audio input, a pure SSB signal has NO modulation and resembles a CW carrier. With the Modulation switch in one of the SB positions, adjust audio balance pots R15A and R18, L2 and the Carrier Balance controls for MINIMUM modulation in the receiver. Minimum modulation corresponds with maximum sideband suppression. It will not be possible to eliminate the modulation entirely due to distortion in the audio oscillator, the speech amplifier and the limitations of sideband suppression. An audio oscillator with less than 1% distortion must be used and the audio input to the exciter should be sufficiently low to prevent overloading of the speech amplifier.

HUM AND CARRIER DRIFT

Lightly loaded RF amplifier stages have excessive voltage gain and tend to be highly regenerative. When two or more linear amplifiers follow the exciter, it often happens that there is an excess of driving power available

HUM AND CARRIER DRIFT (Cont'd)

for the final amplifier. When this occurs, the speech gain control must be turned down low and there will be excessive carrier, carrier drift and hum. The solution for this condition is to adequately swamp the output of the Exciter and first amplifier, to provide a relatively constant load. The hum and noise in the Exciter are normally at least 60 db. down from full output.

UNSTABLE CARRIER OR CARRIER NULL POTENTIOMETERS

These may be cleaned by applying carbon tetrachloride with an eye dropper into the gap directly under the terminals and rotating the knob vigorously.

SIDEBAND REVERSED

If the sideband relationships listed on Page 1 of the Operating Instructions is reversed in units constructed from kits, or when a transformer is replaced, the brown and white modulation transformer leads are improperly coded. To reverse the sidebands, the secondary leads (brown and white) of either modulation transformer should be reversed.

PARASITIC OSCILLATION

Never install antennas, open wire feeders or antenna tuners in close proximity to the VFO, Exciter, or external Exciter wiring. Keep radiated RF from entering the AC power lines. If a separate receiving antenna is used, it should be located as far away as possible from the transmitting antenna, and run at right angles to it.

If the De Luxe Case and Panel are used on a BC-458 VFO, be sure to scrape the paint underneath the nuts on the rear of the cabinet to insure good contact between the case and the chassis. When operating in strong RF fields it may be necessary to add a short heavy jumper from the front of the VFO panel to the front panel of the Exciter. The AC cord from the VFO should be plugged into the same AC outlet as the Exciter to reduce the possibility of large RF pickup loops. On VFOs that have had considerable handling, be sure that the ground connection is intact at the octal male plug that goes to the Exciter. If this connection is broken, severe oscillation will occur.

It is important that the two springs which are attached to the perforated metal cover on top of the 6AG7 coil compartment make good contact with the front panel.

REDUCING PARASITIC OSCILLATION IN LINEAR AMPLIFIERS

Amplifier stages that follow the Exciter must have adequate grid swamping resistance, especially if more than one stage is used.

The amplifier should use a two watt carbon resistor about 50 ohms, connected right at the grid terminal of the tube, in series with the grid lead. The use of series grid resistors raises the drive requirement, especially at the higher frequencies, so the resistance should be kept as low as possible consistent with reliable operation. A plate parasitic suppressor consisting of a few turns of wire on a similar resistor is often required for stability. High power amplifiers may require a series or parallel arrangement of grid resistors to obtain the required dissipation and the plate suppressor should be similar to the Ohmite type P-300. With push-pull or parallel operation, individual suppressors should be used for each tube.

The use of a small series grid resistor has eliminated oscillation even in grounded grid circuits.

Provisions for neutralization should be made when operating tetrodes or pentodes on the higher frequency bands.

TELEVISION INTERFERENCE

Whenever the equipment is operated in TV fringe areas, it may be necessary to use a low pass filter.

It is very important that the Exciter and final amplifier are not driven to the "flattening" point, at which the harmonic output increases considerably, and is almost certain to create TVI. Keep the Speech Level control down to the point where only occasional voice peaks reach maximum amplitude, as observed on an oscilloscope.

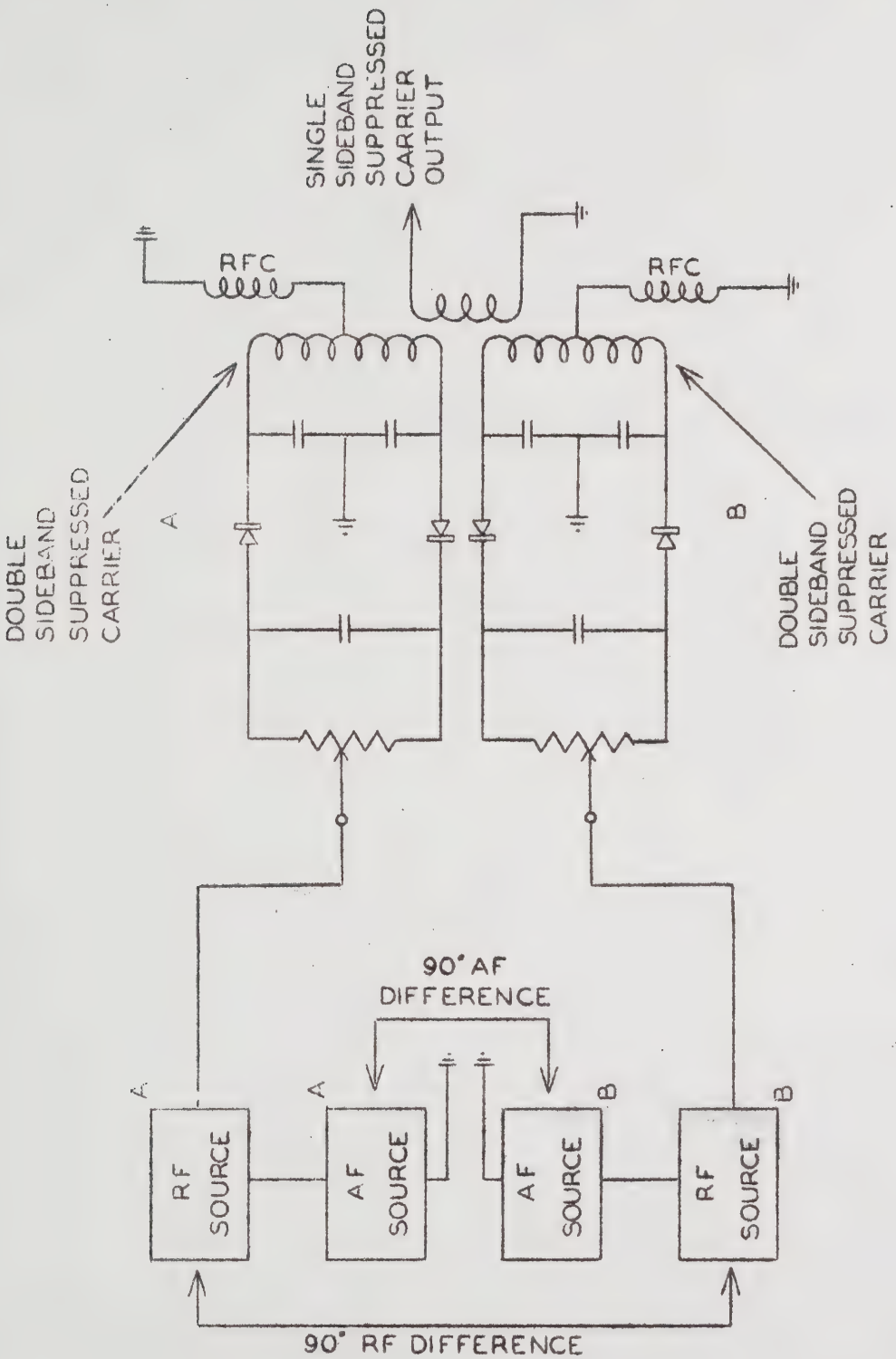
Interference may be generated by an antenna relay in which the antenna contacts are arcing due to improper timing sequence of the auxiliary contacts.

Many TR switches, antenna impedance matching or power indicating meters which rectify radio frequency energy intentionally or unintentionally will often increase the harmonic output, and should be followed by a low pass filter.

M199
10-23-58

20A BLOCK DIAGRAM

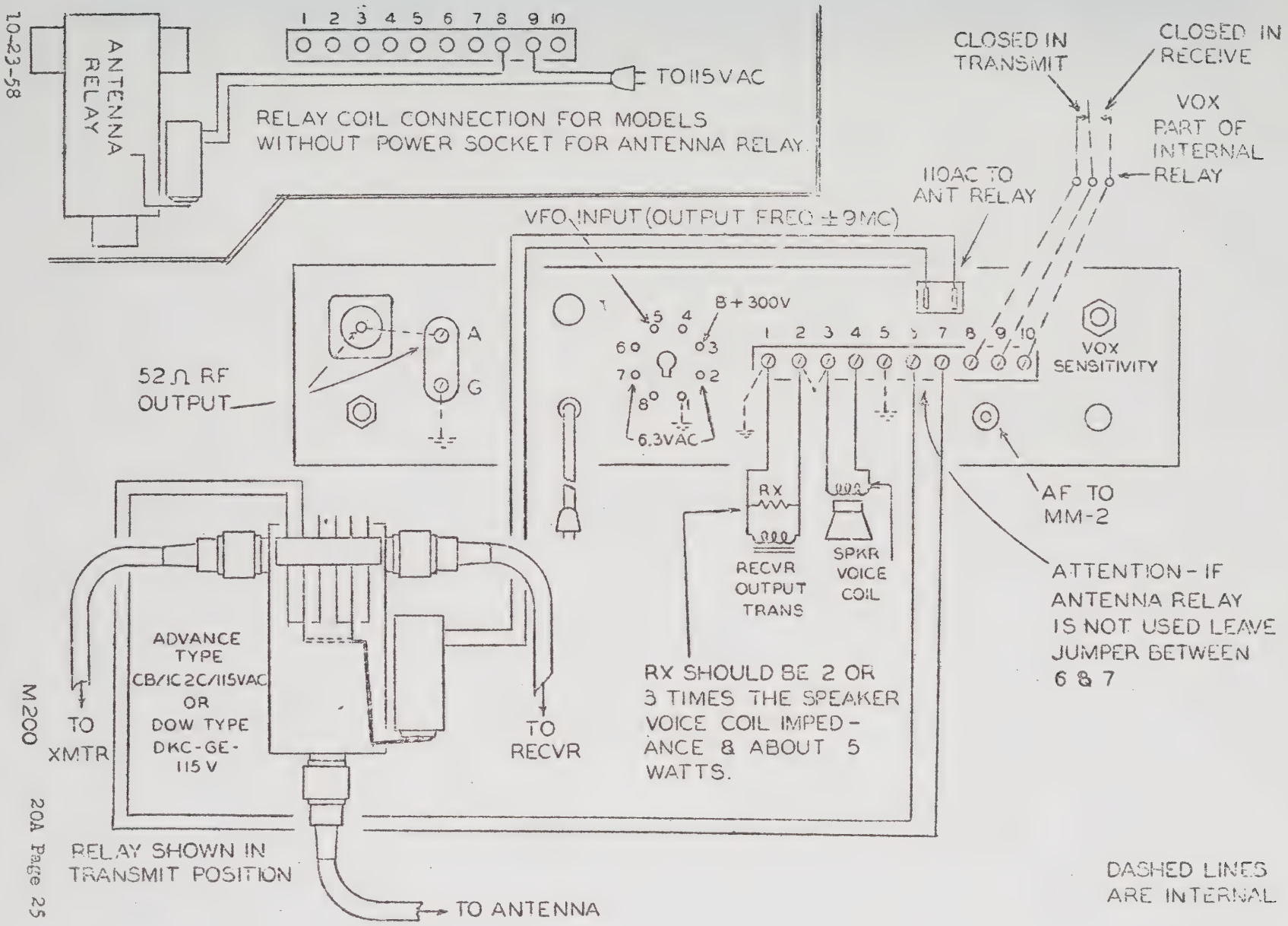
FIG. A1

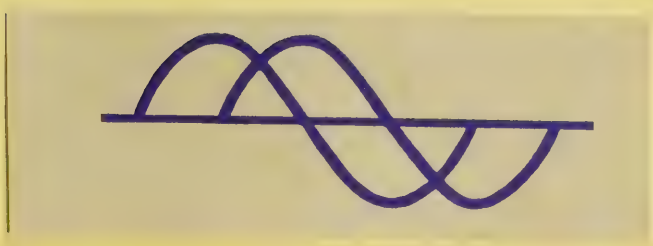


M204

BASIC PHASING SINGLE SIDEBAND GENERATION SYSTEM

FIG A2


10-23-58
ANTENNA RELAY
1 2 3 4 5 6 7 8 9 10
TO 115 VAC
RELAY COIL CONNECTION FOR MODELS WITHOUT POWER SOCKET FOR ANTENNA RELAY.
CLOSED IN TRANSMIT
CLOSED IN RECEIVE
VOX PART OF INTERNAL RELAY
110AC TO ANT RELAY
VFO INPUT (OUTPUT FREQ ±9MC)
B+ 300V
6.3VAC
52Ω RF OUTPUT
A
G
VOX SENSITIVITY
AF TO MM-2
RX
RECVR OUTPUT TRANS
SPKR VOICE COIL
ATTENTION - IF ANTENNA RELAY IS NOT USED LEAVE JUMPER BETWEEN 6 & 7
ADVANCE TYPE CB/IC 2C/115VAC OR DOW TYPE DKC-GE-115 V
TO XMTR
TO RECVR
RX SHOULD BE 2 OR 3 TIMES THE SPEAKER VOICE COIL IMPEDANCE & ABOUT 5 WATTS.
RELAY SHOWN IN TRANSMIT POSITION
TO ANTENNA
DASHED LINES ARE INTERNAL
10A-10B-20A REAR CONNECTIONS
M200
20A Page 25



MULTIPHASE EXCITER

MODEL 10A

INSTRUCTION MANUAL

Central Electronics, Inc.

RESEARCH — DEVELOPMENT — MANUFACTURING

AUDIO — COMMUNICATIONS — MEDICAL ELECTRONICS

Printed in U.S.A

November 15, 1953

M105

CONDENSED OPERATING INSTRUCTIONS FOR MULTIPHASE EXCITER MODEL 10A

Insert proper pair of plug in coils for band desired. Set VFO-XTAL switch to proper position. Turn RED AM carrier knob fully clockwise. Turn OPERATION selector to manual and tune MIXER and AMPLIFIER for maximum output as indicated on a scope, receiver "S" meter or antenna meter. Connect antenna or linear amplifier to the 52 ohm RF output screw terminals. The bottom terminal is ground.

TO OPERATE SINGLE SIDEBAND

Set the MODULATION selector to one of the sideband positions (SB1 or SB2). Turn the OPERATION selector to manual. Adjust the CARRIER knobs (AM and PM) for minimum output as indicated on an oscilloscope or receiver "S" meter. Adjust the SPEECH LEVEL control. (Between 10 and 12 o'clock depending upon microphone gain.) Talk into the microphone and your on SSB !

TO OPERATE AM

Place the MODULATION selector in the AM position. Leave the PM CARRIER knob in the balanced-out condition. Adjust the red AM CARRIER knob until maximum carrier output is reached. Then reduce the AM CARRIER level to one half of the maximum value on the scope or to one half the maximum antenna current. Adjust the SPEECH LEVEL until modulation peaks just reach the maximum output value. Too little or too much carrier will make the AM transmission sound distorted.

TO OPERATE PM (Narrow band phase modulation)

Turn modulation selector to PM position. Leave the AM CARRIER knob in the balanced-out condition. Adjust the black PM CARRIER knob to nearly full output. Adjust the SPEECH LEVEL control so that the modulation peaks do not exceed the carrier.

TO OPERATE CW

Turn the SPEECH LEVEL off. Place the OPERATION selector on manual. Turn the AM CARRIER to nearly maximum output. Plug key in jack on rear of chassis.

TO USE THE VOICE CONTROL CIRCUIT (VOX)

Connect the receiver speaker to the exciter as shown in the circuit diagram. The resistor across 1 and 2 on the rear terminal strip should be about three times the speaker voice coil impedance and rated at twice the power output. The extra contacts on 8, 9 and 10 may be used to operate an antenna relay, receiver silencing circuits, etc. With the OPERATION selector in VOX position talk into the microphone and adjust the VOX sensitivity control on the rear for proper operation.

Multiphase Exciter Model 10A

2/2/53 Mod.

Printed in USA

10A GENERAL ALIGNMENT PROCEDURE

The front panel controls should be set as follows:

SPEECH LEVEL, completely counterclockwise.
MODULATION switch, Sideband 1.
AM CARRIER, Mid position.
PM CARRIER, completely clockwise.
VFO - XTAL switch, in correct position.
OPERATION switch, MANUAL

Plug in the proper MIXER and AMPLIFIER coils, and adjust the tuning controls to the desired output frequency.

Refer to Fig. A. Connect a non-inductive load resistor of about 50 ohms, 10 watts, to the exciter RF output terminals. This resistor may consist of several one or two watt composition resistors in parallel to provide the required resistance and dissipation. For example, ten one-watt 500 ohm or five 250 ohm two-watt resistors may be used.

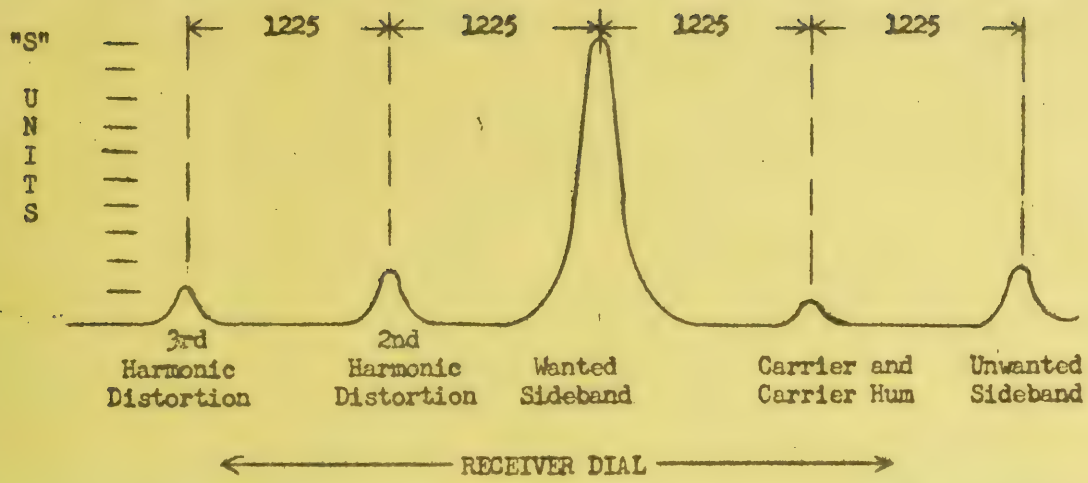
Connect an oscilloscope, lightly coupled, to the RF output.

If available, an RF vacuum tube voltmeter having a 25 volt range should be connected to the RF output.

Tune the crystal oscillator tank circuit until the signal is heard in a receiver tuned to 9000 kc. If a receiver or grid dipper is not available a DC voltmeter connected to the cathode, Pin #8, of the 12BH7 oscillator tube will serve as an indicator. When the xtal is not oscillating the reading will be about 10 V DC. When the stage is oscillating and L1 is tuned for maximum the reading will be approx. 20 V DC. Turn the power switch on and off several times to make certain the crystal oscillates reliably. If necessary readjust L1 for proper operation.

At this point it should be possible to hear a signal on the output frequency with the receiver operating near full sensitivity (AVC on) provided that the VFO or frequency conversion crystal is operating. The receiver antenna should be lightly coupled to the exciter output terminals. Refer to Fig. B. Adjust L2, L3, L4, L5 and the MIXER and AMPLIFIER tuning condensers for maximum output. As maximum output is reached, it may be necessary to reduce the carrier by adjusting the PM carrier control to provide slightly less output. This will prevent overloading the 6AG7 amplifier. Now adjust both carrier controls for minimum carrier output. Minimum output may not necessarily occur at the center of the scale due to stray circuit capacities etc. Next unbalance the PM control a slight amount to give about one fourth the maximum output and peak L2 through L5 again. Now adjust both carrier controls again for minimum carrier output. It will probably be found that the carrier controls will null at slightly different settings than those obtained previously. Turn the PM control completely clockwise and see if the crystal remains in oscillation. Unbalancing this control places an additional load on the oscillator and may pull it out of oscillation. If this occurs, it will be necessary to vary the adjustment of L1 until reliable operation is assured.

When L2 (green) is mounted as close as possible to L1 (red), the RF voltage from the arms of the carrier pots to ground will be approximately equal when the carrier is balanced out. If desired, this may be checked with an RF vacuum tube voltmeter.



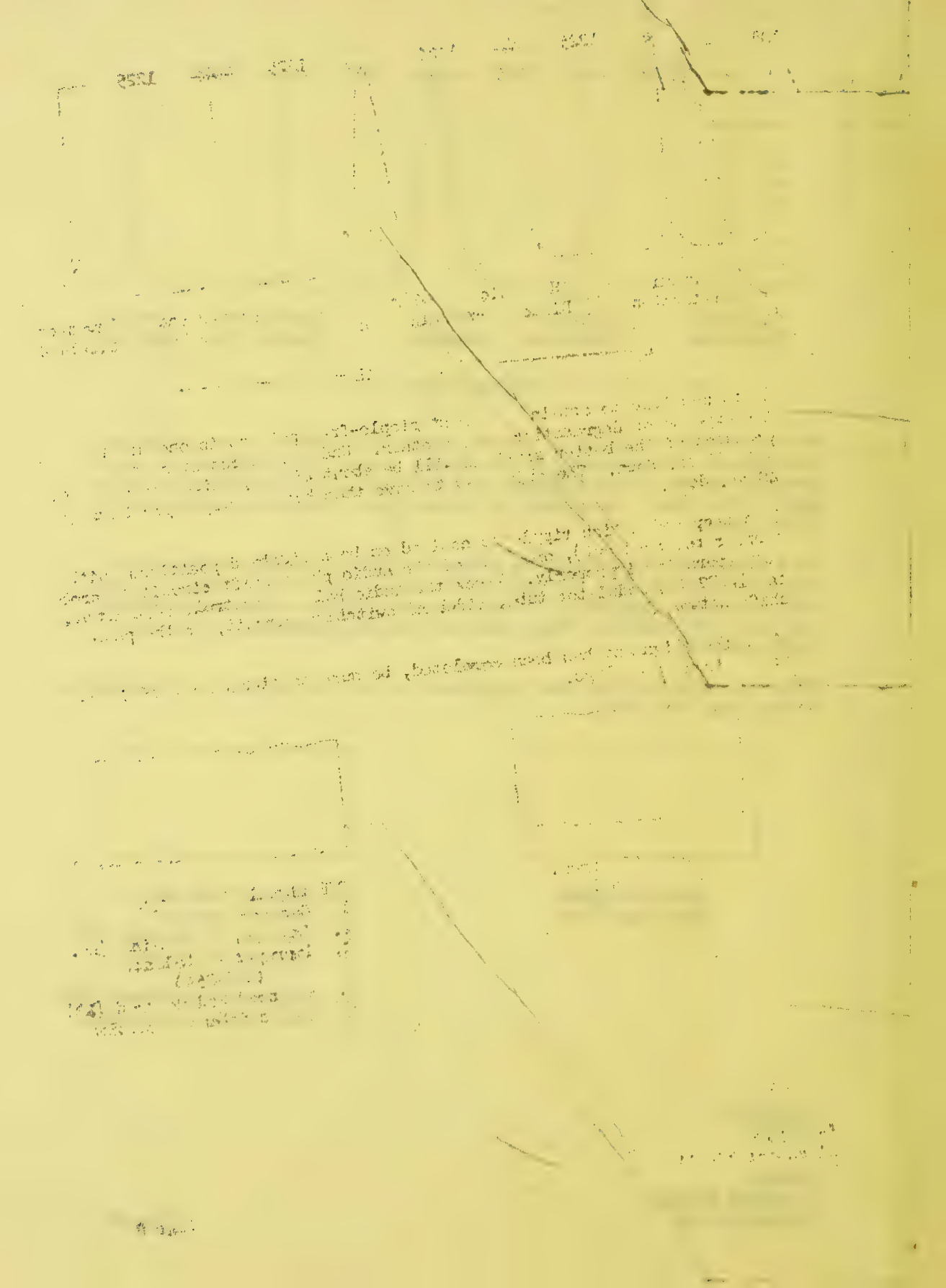
It is possible to obtain an almost ripple-free pattern in one sideband at the expense of degradation of the other. Under this condition the suppression of the better sideband will be about 45 db., while the other is only 35 db. down. The object is to have them both equal, approximately 40 db. down.

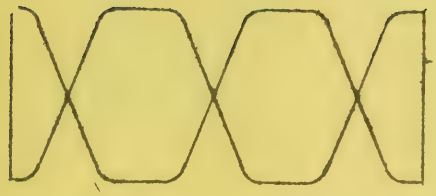
If a deep modulation ripple is noticed on both sideband positions (with carrier balanced out), one side of the audio phase shift circuit is probably operating improperly. Check the Audio Balance controls adjustment, the 12AT7 (B) modulator tube, sideband switching circuit, or the phase shift network.

After the alignment has been completed, be sure to tighten the #6 lock-nuts on the iron core slugs.

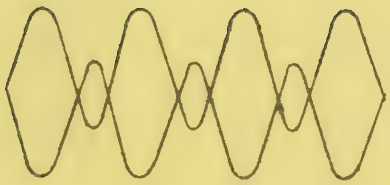
Good SSB Signal
Pure Tone Input

SSB Signal, Tone Input
1. Carrier leakage
2. Improper RF phasing (L2)
3. Improper AF balance (R18-15A)
4. Balanced Mod detuned (L3)
5. Poor sideband rejection

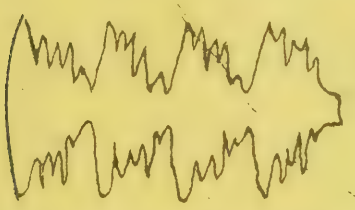




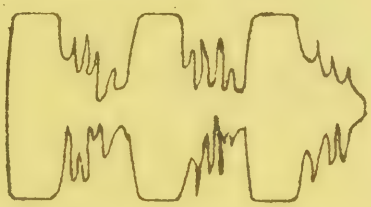
SSB WITH CARRIER, TONE INPUT.
1. EXCESSIVE AUDIO
2. INSUFFICIENT ANT. LOADING



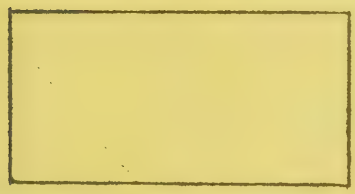
DSRC DOUBLE SIDEBAND REDUCED CARRIER OBTAINED BY REDUCING CARRIER LEVEL AND INCREASING AUDIO INPUT LEVEL.



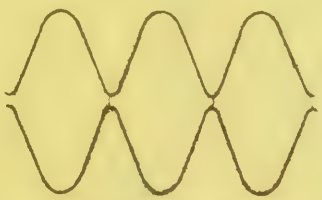
GOOD SSB SIGNAL VOICE INPUT



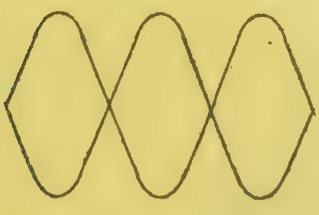
SSB SIGNAL, VOICE INPUT SQUARING AUDIO PEAKS EXCESSIVE SPEECH GAIN



SSB SIGNAL, TONE INPUT AMPLIFIER OVERLOADING DUE TO EXCESSIVE AF OR RF DRIVE. NOTE THE LACK OF SMALL RIPPLE ON ENVELOPE



DOUBLE SIDEBAND AM WITH CARRIER 100% MODULATED



TWO TONE LINEARITY TEST OBTAINED WITH SINGLE TONE INPUT, WITH CARRIER BALANCED OUT ON AM

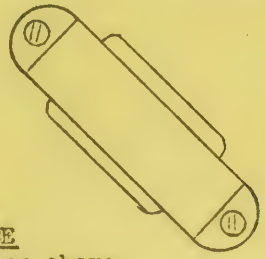
FOR ADDITIONAL REFERENCE THE FOLLOWING IS RECOMMENDED:

SUGAR COATED LINEAR AMPLIFIER THEORY - OCTOBER '51 QST

HOW TO TEST AND ALIGN A LINEAR AMPLIFIER - MAY '52 QST

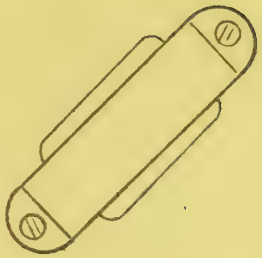
AUDIO BALANCE

Adjust for minimum unwanted sideband ripple with 1225 cycle tone input.



AUDIO BALANCE

Adjust same as above.

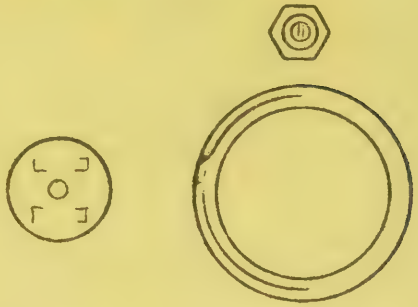


5. BLUE 9000 kc. FILTER

Adjust for max output with PM control unbalanced to give nearly full output.

7. YELLOW 15 mc. TRAP

Use XTAL at approx. 5150 kc. or 3850 kc. Adjust for minimum 15 mc. output with 20 meter coils inserted, and mixer and amp tuned for max 15 mc. output.



4. BLACK 9000 kc. FILTER

Adjust for max output with PM control unbalanced to give nearly full output.

6. ORANGE 15.9 mc. TRAP

Adjust in same manner as yellow trap.

1. RED XTAL OSC.

9000 kc.

Peak for max output then back off to insure reliable crystal operation. PM control fully clockwise.

2. GREEN 90° RF PHASE SHIFT

9000 kc.

Peak for max output with PM control unbalanced to give nearly full output. Afterward, adjust for equal sideband suppression with audio osc to mic input.

3. WHITE BALANCED MODULATOR

9000 kc.

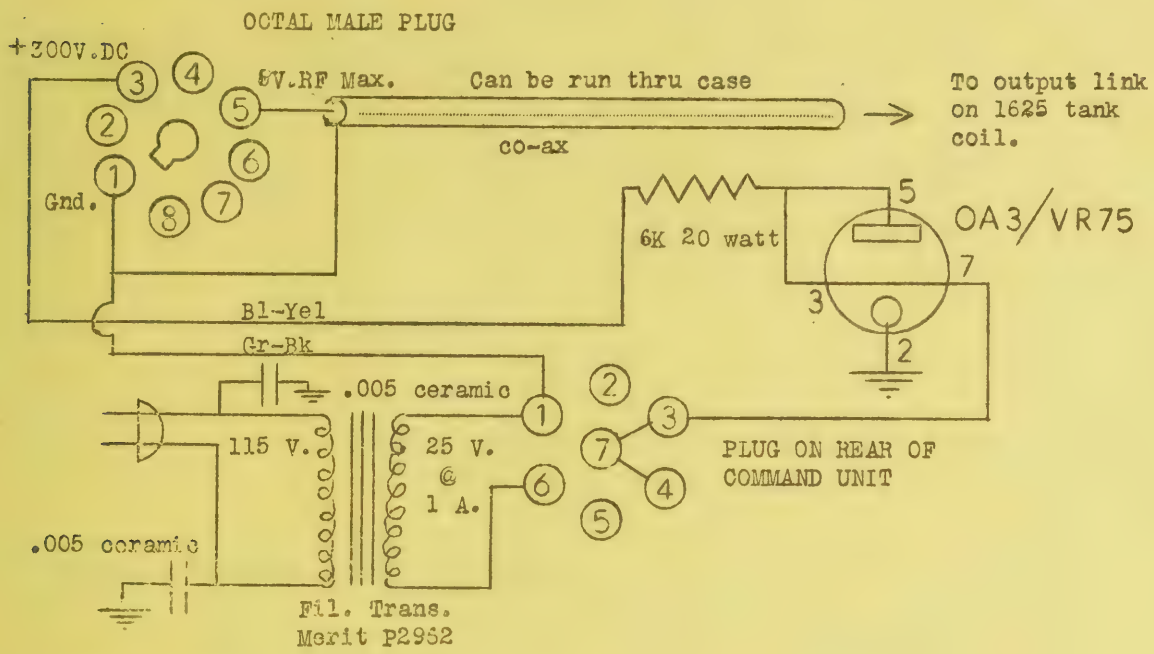
Adjust for max output with PM control unbalanced to give nearly full output.

FIG B

ALIGNMENT DATA
MULTIPHASE EXCITER MODEL 10A

MODIFYING THE BC-457, 458 and 459 AS A VFO FOR THE
MODEL 10A MULTIPHASE EXCITER

EXTERNAL CONNECTIONS



INTERNAL CHANGES

The contacts on K53 relay should be closed by jumpers or a wedge in the armature. This applies B plus to the oscillator and also completes the cathode to ground circuit on the 1625 stage. The cathode lead of the paralleled 1625 should be opened to reduce the current drain. Only one 1625 is necessary for proper operation.

The leads going to pin #8 of the eye tube VT-138 should be disconnected.

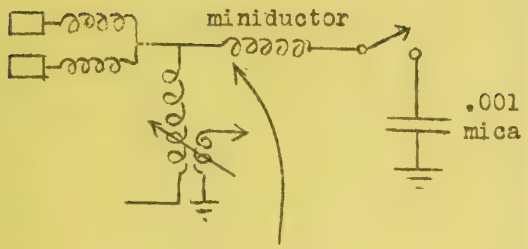
The antenna loading coil and antenna relay are not used, and can be removed. The co-ax cable to the 10A exciter can be attached directly to the output link of the 1625 final tank coil.

Plate voltage for the VFO is supplied by the 10A exciter through an octal socket on the rear. The RF input to the mixer in the exciter also appears on this socket. It is suggested that the filament transformer, VR75 and its dropping resistor be mounted on a shelf or a chassis attached to the rear of the command unit.

The electrical connections for the external wiring are shown above.

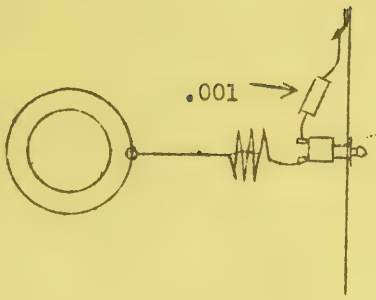
The antenna coupling adjustment on the command unit should be advanced to the point where additional coupling will not increase the exciter output. Over injection to the mixer will generate harmonics of the VFO frequency that can appear in the output as spurious radiation. For 14 mc. operation with a BC-457 a point of critical coupling can be found that will cancel the 3rd harmonic output from the mixer.

SCHEMATIC



Vary last quarter turn for maximum output.

TOP VIEW



MODIFICATION KIT #40BC457 OR #40BC458 PARTS LIST.

1 -- Mounting plate (Drilled as per drawing on page ELEVEN)
1 -- Miniductor cut to size.
4 -- Rubber feet.
4 -- Sheet metal screws for mounting feet.
1 -- Bristol wrench.
1 -- .001 mica 500 volt.
1 -- S.P.S.T. toggle switch, washer and nut.
4 -- (each) #4-40 Screws, nuts and lockwashers.
1 -- Soldering lug.

NOTE: Kit number must be specified when ordering.

PRICE per kit (postpaid) $1.50

CENTRAL ELECTRONICS, INC.
2125 W. Giddings Street,
Chicago 25, Illinois

MULTI-BAND OPERATION OF THE MULTIPHASE EXCITER MODEL 10A

The following chart indicates the injection frequencies required with the 9 mc. master oscillator.

OUTPUT FREQUENCY	INJECTION FREQUENCY
1800 kc.	7200 kc.* or 10800 kc.
2000 kc.	7000 kc.* or 11000 kc.
3500 kc.	5500 kc.* or 12500 kc.
3800 kc.	5200 kc.* or 12800 kc.
4000 kc.	5000 kc.* or 13000 kc.
7000 kc.	16000 kc. or 5333.3 X 3 kc.
7200 kc.	16200 kc. or 5400 X 3 kc.
7300 kc.	16300 kc. or 5433.3 X 3 kc.
14000 kc.	5000 kc.* or 23000 kc.
14200 kc.	5200 kc.* or 23200 kc.
14300 kc.	5300 kc.* or 23300 kc.
21000 kc.	12000 kc. or 30000 kc.
21450 kc.	12450 kc. or 30450 kc.
28000 kc.	37000 kc.
28500 kc.	37500 kc.
29700 kc.	38700 kc.

* Injection at these frequencies may be obtained from crystals plugged into the front panel socket.

NOVICE OR C.W. OPERATION ONLY

Break-in CW may be used on the 160, 80 and 40 meter bands with direct frequency crystals. Turn the speech level control OFF, and remove the 9000 kc. crystal. Then plug the 160, 80 or 40 meter crystal into the socket on the front panel and tune the controls to frequency.

Frequency multiplication may be used only when the exciter feeds a high "Q" antenna tuner or power amplifier stage, due to probable radiation of sub-multiple frequencies. It is possible to obtain 80 meter output from 160 meter crystals, 40 meter output from 80 meter crystals, and 20 meter output from 7 mc. or 4.7 mc. crystals

10A PRELIMINARY ALIGNMENT INSTRUCTIONS

THE FOLLOWING IS RECOMMENDED FOR UNITS CONSTRUCTED FROM KITS

Check for "B" shorts with an ohmmeter before power is applied.

Before plate voltage is applied, the 6AG7 grid bias should be checked. This should be done by removing the 5U4G rectifier tube. With the relay in the normal position, the reading at Pin #4 of the 6AG7 should be -100V DC plus or minus 10% measured with a VTVM. When the relay is operated by hand, there should be approx. -11V DC at this point. After the 5U4G is inserted, the operating bias should be -10.5V DC obtained from the voltage divider R47 and R48.

Insert the 5U4G rectifier and apply power. Check "B" voltages in accordance with the chart on the circuit diagram, with the OPERATION switch on MANUAL.

Preliminary rough alignment of the slug-tuned coils: If a grid dipper is available the coils should be aligned to the frequencies indicated on the Alignment Data Chart, Fig. B. If no dipper is available they should be set as follows BEFORE POWER IS APPLIED:

#1 RED 3/16"

#2 GREEN 3/16"

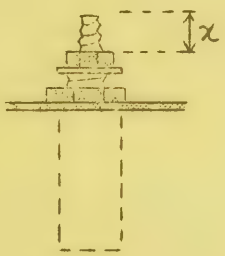
#3 WHITE 1/16"

#4 BLACK 1/2"

#5 BLUE 1/2"

#6 ORANGE 5/16"

#7 YELLOW 5/16"



The Audio Balance controls should be set in approximately mid-position.

Proceed with the General Alignment Instructions.

Adjustment of L6 and L7. These trap circuits need be adjusted only when 20 meter operation is contemplated. Their purpose is to reduce radiation of the third harmonic generated in the mixer of the heterodyning crystal oscillator or VFO operating in the range of 5000 to 5350 kc. With the 20 meter coils in place, the SPEECH LEVEL turned off, carrier balanced out, and OPERATION control in the manual position, it will be possible to find output with an oscilloscope or receiver when the MIXER and AMPLIFIER are tuned to approx. 15 mc. Adjust these tuning controls for maximum output using a crystal or VFO at approx. 5150 kc. If no crystal is available in this range, one at approx. 3850 kc. will provide enough 4th harmonic output for alignment of the traps. When a crystal is used, L7 should be tuned for minimum 15,450 kc. output. When a VFO is used, only L6 will provide a null at 15.9 mc.

The VFO output should be advanced up to the point where additional coupling will not increase the exciter output. Over-injection to the mixer will generate harmonics of the VFO frequency that can appear in the output as spurious radiation.

Although the 3rd harmonic output may be only a few percent of the total, it will be amplified by the Mixer and Amplifier stages resulting in a sizeable output. With the trap circuits properly aligned, the power output at 15 mc. will be less than 10% of that normally produced at 14 mc., even though the Mixer and Amplifier are tuned to 15 mc. When the Mixer and Amplifier are peaked on 14 mc., the 15 mc. signal will be down in excess of 50 db. This is adequate rejection when the exciter alone is used to feed an antenna. The addition of a properly tuned linear amplifier stage will increase the rejection of 15 mc. to at least 70 to 80 db. down.

SIDEBAND SUPRESSION ADJUSTMENT

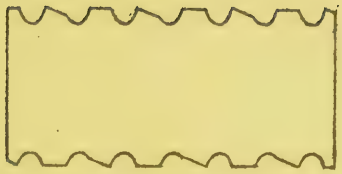
Before proceeding with the Single Sideband adjustments, it is recommended that the operator familiarize himself with the illustrations of the oscilloscope patterns shown in this manual. The ultimate objective in the single sideband alignment is to obtain a pattern containing a minimum amount of ripple when a pure sine wave is applied to the microphone input. These adjustments should preferably be made at less than full output, to prevent amplifier overloading, which might "wipe off" the small modulation ripple.

A low distortion audio oscillator (less than 1%) set to approx. 1,225 cycles, with an output level between .005 and .05 volts should be connected to the microphone jack. CAUTION: If a voltage in excess of .075 is applied to the Mic. input the speech amplifier will overload and it will be impossible to adjust the exciter properly.

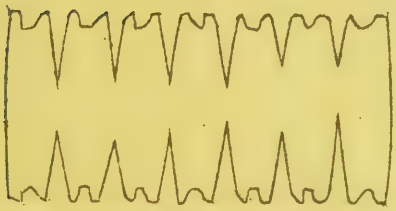
Adjust both CARRIER pots for minimum carrier output. Advance the SPEECH LEVEL control until about half of maximum output is obtained on the oscilloscope. At this point a fair amount of ripple will be observed on the output wave. Adjust the Audio Balance controls for MINIMUM ripple. Now switch from Sideband 1 to Sideband 2 and observe the ripple in each. If the amount of ripple is not equal, vary the adjustment slightly on L2 until the displays are identical in either sideband position. However, each time L2 is tuned, it will be necessary to rebalance both carrier controls for minimum. It will also be necessary to readjust the Audio Balance controls again.

It is possible to make these sideband suppression adjustments using a receiver in place of an oscilloscope. Turn the AVC on, the BFO off, and remove the antenna to prevent receiver overload. Now tune in the signal. Minimum modulation heard in the loudspeaker corresponds to minimum modulation of the R.F. envelope. Adjust as described in the previous paragraph.

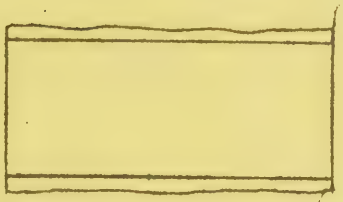
SSB SIGNAL, TONE INPUT
WITH PROPER CARRIER INSERTED
100% MODULATED



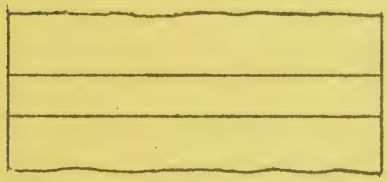
SSB SIGNAL, TONE INPUT
AUDIO DISTORTION
EXCESSIVE AUDIO INPUT
EXCESSIVE DISTORTION IN
AUDIO OSCILLATOR



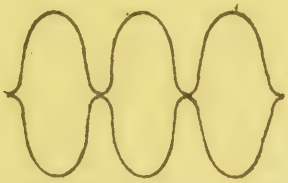
SSB SIGNAL, TONE INPUT
INSUFFICIENT 9000 kc. XTAL
OSCILLATOR OUTPUT



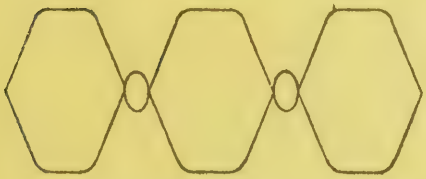
GOOD SSB SIGNAL, TONE
INPUT WITH SMALL PER-
CENT OF SPURIOUS RADIA-
TION (RF)



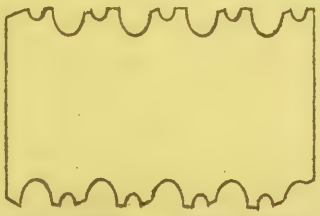
GOOD SSB SIGNAL, TONE INPUT
WITH LARGE PERCENT OF
SPURIOUS RF RADIATION



SSB WITH CARRIER, TONE
INPUT IMPROPER AMPLIFIER
BIAS



DOUBLE SIDEBAND WITH CARRIER
EXCESSIVE TONE MODULATION
WITH AUDIO PEAKS SQUARING OFF



SSB SIGNAL, TONE INPUT
BALANCED MOD DETUNED (L3)

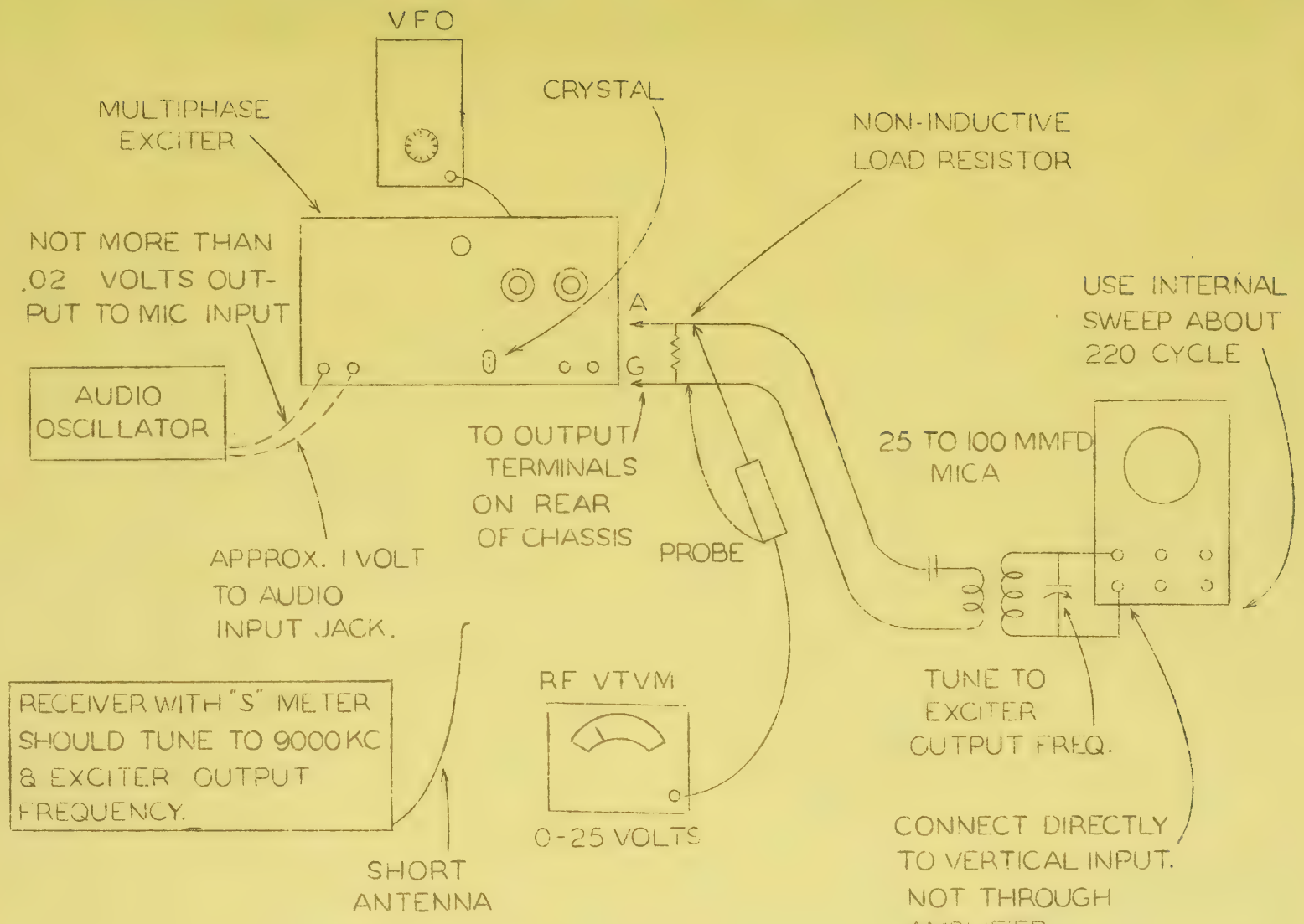
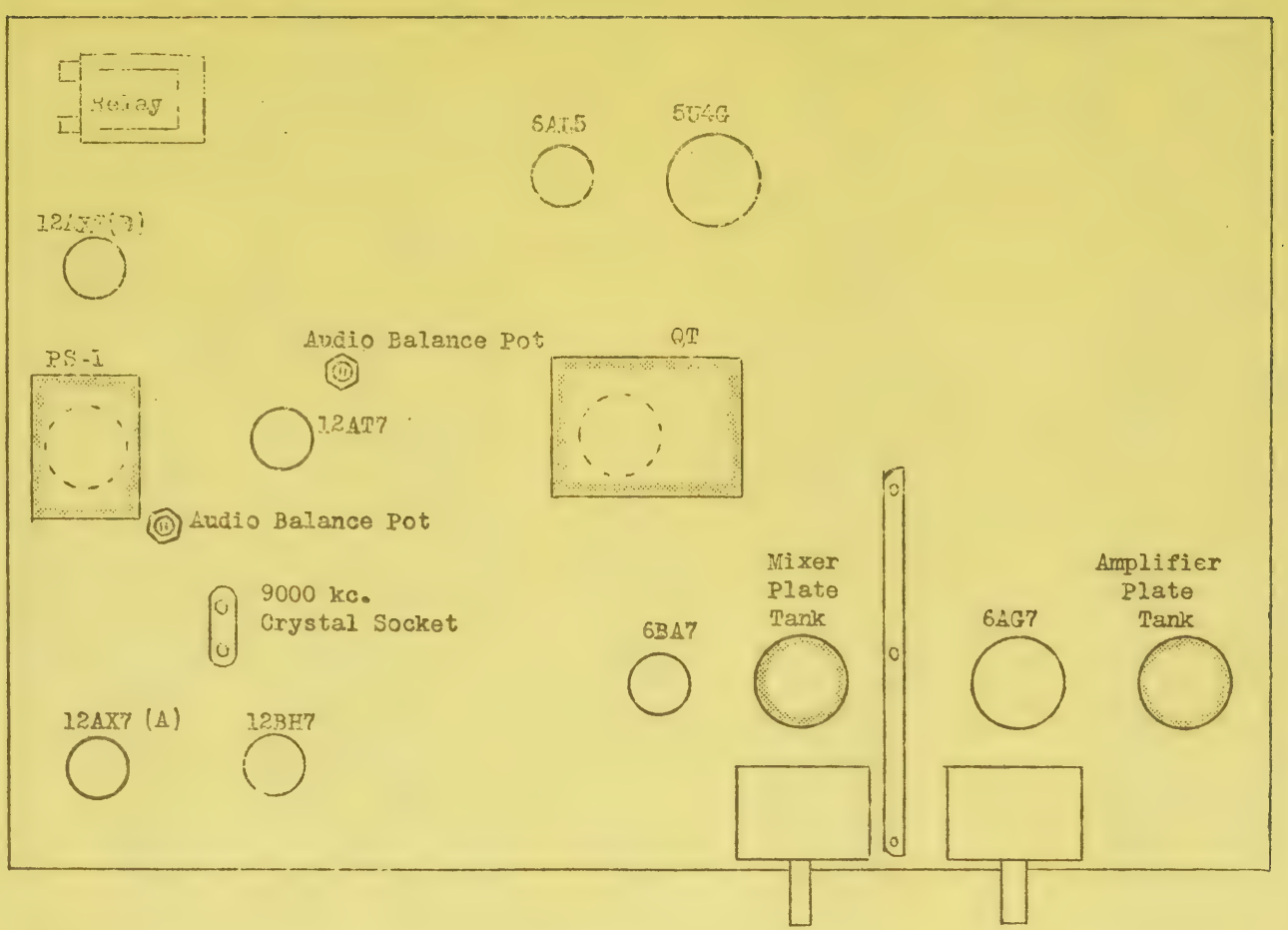
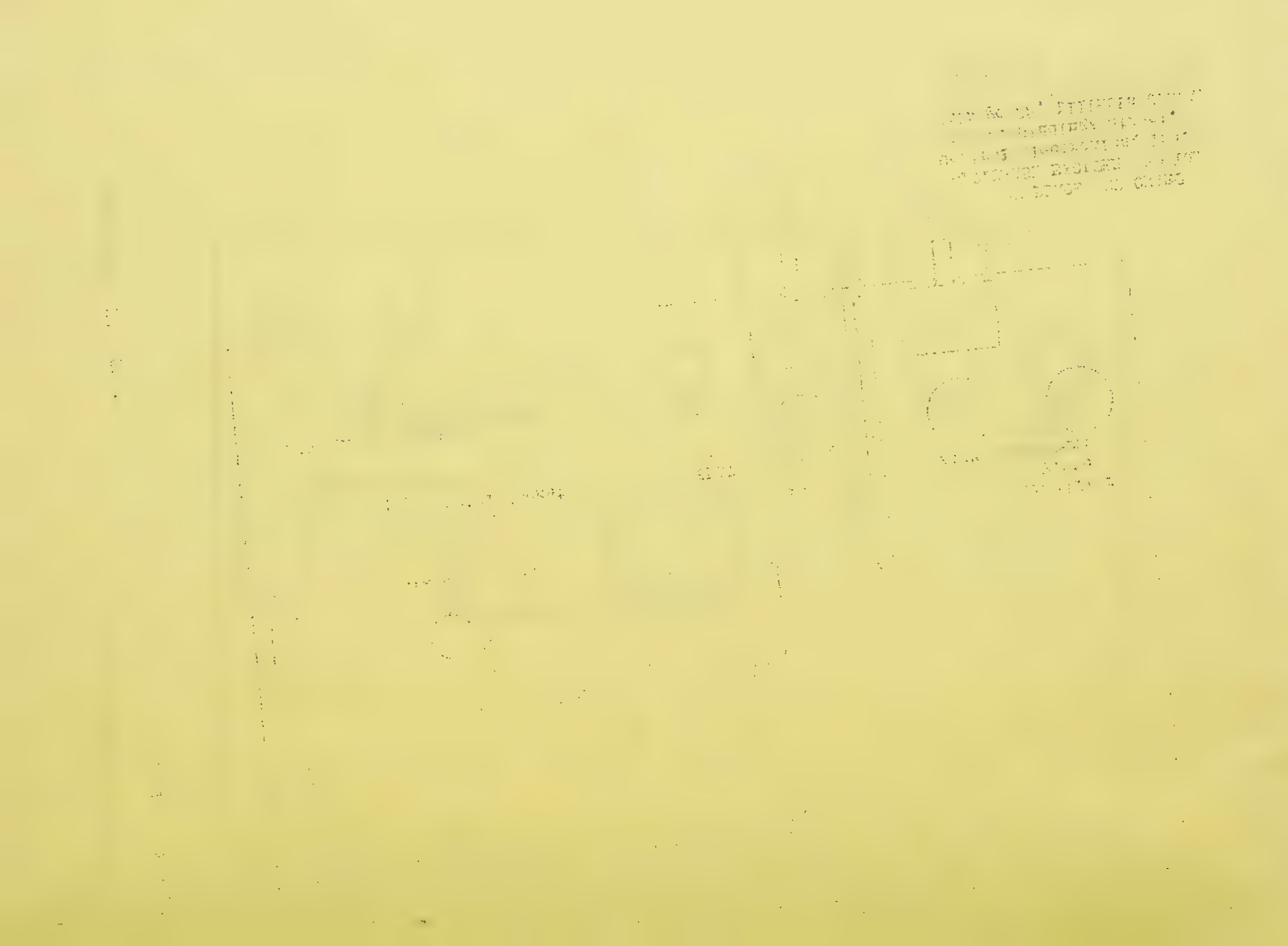

VFO
CRYSTAL
MULTIPHASE EXCITER
NON-INDUCTIVE LOAD RESISTOR
NOT MORE THAN .02 VOLTS OUT-PUT TO MIC INPUT
A
G
USE INTERNAL SWEEP ABOUT 220 CYCLE
AUDIO OSCILLATOR
TO OUTPUT TERMINALS ON REAR OF CHASSIS
25 TO 100 MMFD MICA
PROBE
APPROX. 1 VOLT TO AUDIO INPUT JACK.
RECEIVER WITH "S" METER SHOULD TUNE TO 9000 KC & EXCITER OUTPUT FREQUENCY.
RF VTVM
TUNE TO EXCITER OUTPUT FREQ.
0-25 VOLTS
CONNECT DIRECTLY TO VERTICAL INPUT. NOT THROUGH AMPLIFIER
SHORT ANTENNA

FIG. A



TUBE PLACEMENT CHART
MULTIPHASE EXCITER MOD 10A
Central Electronics, Inc.
2125 W. Giddings Street,
Chicago 25, Illinois U.S.A.



USING THE BC-457 FOR 80, 40 AND 20 METER OPERATION

The use of a 1.7 to 2 mc. crystal or VFO for 40 meter operation is not recommended. A fourth harmonic of the injection frequency would be generated in the mixer stage and appear in the mixer output.

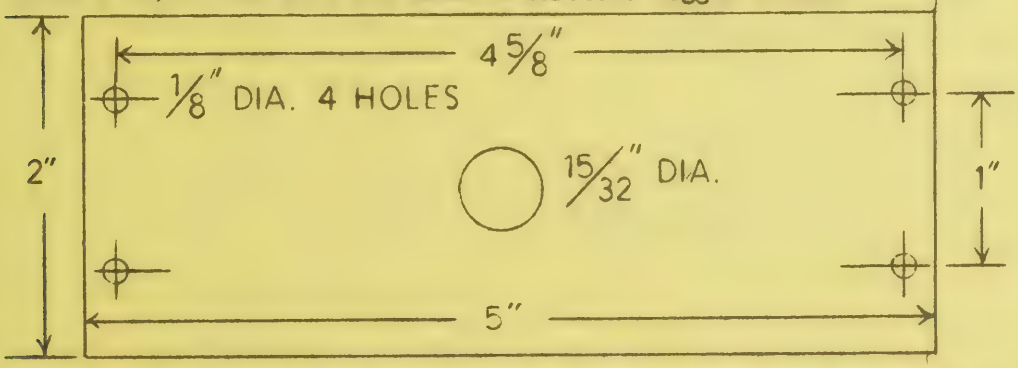
If the band-setting capacitors of the BC-457 are decreased in capacity to extend the oscillator tuning range to 5433 kc., the 1625 stage may then be operated as a frequency tripler in the range of 16 to 16.3 mc. by switching in a parallel plate inductor.

Use of the BC-457 for this purpose will alter the original frequency calibration. For those who prefer to retain the original dial calibration and utilize higher oscillator circuit capacity, the use of a BC-458 (5.3 to 7 mc.) is recommended.

MODIFICATION

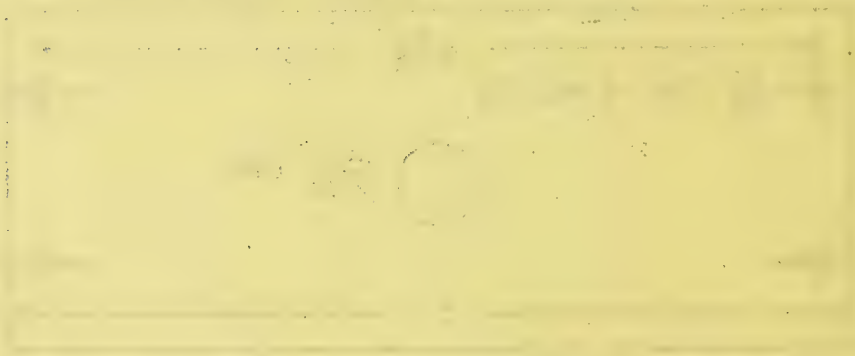
The changes listed on page TEN should be made first.

1. Remove the antenna loading assembly and window.
2. Cut a metal plate 2 X 5 inches and drill to mount in the four front panel holes that previously held the rotary coil. In the center of this plate drill a 15/32 inch hole and mount a S.P.S.T. toggle switch.



3. Drill four holes in the bottom plate of the unit, about 1 inch in from each corner, and mount four rubber feet to reduce mechanical shock. As an alternative the unit may be set on a sponge rubber pad.
4. Prepare a coil of approx. .375 uh. (5 turns, 1" dia. spaced 8 turns per inch, B&W miniductor #3014) with a 3/4 inch lead on one end and a 2 1/2 inch lead on the other. Then cut one polystyrene bar at the long end so that the last quarter turn of the coil may be varied as a means of trimming the inductance.
5. Solder a .001 mica capacitor from one terminal of the toggle switch to a ground lug on one of the screws that mount the metal plate. Solder the short end of the miniductor to the other switch terminal. Solder the long lead of the miniductor to the top terminal of the ceramic form, at the junction of the 1625 plate parasitic suppressors.

A circuit diagram of this modification appears on the following page with a parts list of a modification kit offered by CENTRAL ELECTRONICS, INC.



ALIGNMENT INSTRUCTIONS

CAUTION: Do not alter original adjustment of two variable iron core slugs.

Plug the VFO into the rear of the Multiphase Exciter.
Place the parallel inductor switch in the off (open) position.
Set your receiver to 7300 kc. with BFO on.
Adjust exciter dials to approximately 7.2 mc. with the 40 meter coils in place and insert carrier with the Operation switch in MANUAL.
Set the dial of the BC-457 about 1/4 inch past the 5.3 mc. mark. The frequency of the unit is varied by turning the oscillator capacitor which is located in the shield can on top of the unit. Sufficient variation of this capacitor may be obtained by loosening the binder head set screw accessible through a 7/16 inch hole on the right side of the can. Move the oscillator capacitor arm to minimum capacity. (Completely counterclockwise) At this time the VFO signal should be heard in the receiver. If it is not, adjust the small trimmer accessible through the top of the oscillator can until it is.
The amplifier capacitor which is located underneath the chassis is adjusted in the same manner as the above. Peak this capacitor to the oscillator frequency by using the OA3/VR75 as an indicator. Adjust for maximum brilliance.
Now switch in the parallel inductor and vary the spacing of the last quarter turn until maximum output is obtained. (Maximum exciter output or maximum brilliance on the VR tube.) CAUTION: Plate voltage is present on coil.

The kit for this modification is #40BC457.

NOTE: If so desired, 7300 kc. may be made to tune at the 5.3 mc. mark on the unit dial by removing the shield can and loosening the bristol set screw to obtain greater variation in the oscillator capacitor. If this is done the same procedure may be necessary on the amplifier capacitor.

USING THE BC-458 FOR 40 METER OPERATION

In this unit the amplifier stage is also operated as a frequency tripler in the range of 16 to 16.3 mc. by switching in a parallel inductor.
It may also be used for operating in the range of approximately 14230 kc. and up without affecting the dial calibration. In this case, 14.3 mc. will occur at 5.3 on the dial, and the rest of the band in the portion below this calibration. It will probably be possible to reach 14200 kc. by merely adjusting the trimmer in the top of the oscillator can. If this does not quite reach, it may be necessary to move the arm on the oscillator and amplifier capacitors slightly clockwise. These changes will affect the calibration a trifle.
The parallel plate inductor for this purpose consists of three turns of #3014 B&W miniductor (8 turns per inch). Break the polystyrene strip so that the last quarter turn may be varied to trim the inductance.

The kit for this modification is #40BC458.

USING THE BC-458 FOR 80, 40 AND 20 METER OPERATION

This conversion is similar to that of the BC-457. In this case the oscillator and amplifier capacitors must be set so that the circuits reach 5000 kc. With the dial set at 5300 kc. It may be necessary to loosen the bristol set screws to obtain this result. This is the most desirable unit to use, inasmuch as the oscillator circuit is operating with nearly full capacity for all three bands.

The kit for this modification is #40BC458.

PRE - AMP
12AX7(a)

HI-Z MIC

G-W

R-1 1M

R2 2.2K

R3 220K

C1 .005

R4 220K

C2 8 MFD @ 450V

R5 2.2K

C3 .005

R6 220K

R11 10K

R-Y +300V

R12 1M SPEECH LEVEL

R13 4K

C4 .0025

AF DRIVER
½ 12BH7

R14 1K

DRIVER TRANS T1

27AM-24

BL

R

R-BK

BK

R15 400Ω 1%

R15A 100Ω AF. BAL

G

R16 1400Ω 1%

S3(c)

12

11 10 9 8 7

VOX STBY CAL STBY MAN

BL-W

+300V R-Y

PS-1

R7 133.3K 1%

C7

C8

R8 100K 1%

R9 100K 1%

C9

C10

R10 133.3K 1%

3 4 2 5 6 9 7 8 1

G

G-W

90° AF

AF MODULATOR
12AT7

2 3 8 7 6

BLU

R19 1K AF BALANCE

R18 1K

560 R17

T2

27A0-79

R R-Y +300V

BK

W BR

SB-1

T3

BLU

MOD. TRANS.

MODU SELE

TERMINAL NUMBERS 1 TO 9
OF 9 PIN PLUG - IN PS-1
PHASE SHIFT NETWORK

T-1 SOCKET

4 5 6 7 8 1

BL-Y

R-Y

0-W

6.3 AC

6.3AC

+300V

C38 .002

VOICE AMP
½ 12AX7(b)

VOICE RECT.
½ 6AL5

VOX SENS. R35 1M

R36 470K

C39 .05

R37 1K

R38 100K

R39 100K

R40 470K

R40A 1M

C40 .25

OPERATION SELECTOR S3(a,b,c)

S3(a)

24 23 19

VOX STBY CAL STBY MAN

BK

G-O

R-G

R41 1M

R43 470K

+300V R-Y

R42 47K

R44 68K

-100V BR-Y

KEY

RELAY CONTROL
½ 12AX7(b)

K-1

BLU

2 1 3 8 6 7

R45 2.2K

R45A 470K

C41 8 @ 450V

3PDT RELAY
10000Ω COIL

BL-W BL-Y

SEE INTERNAL

R46 4.7K 2W

PHONES

R-Y +300V

OU

PRE - AMP
12AX7(a)

AF DRIVER
½ 12BH7

DRIVER TRANS

PS-1

AF MODULATOR
12AT7

MOD. TRANS.

MODU SELE

HI-Z MIC

G-N

R-1 1M

R2 2.2K

R3 220K

C1 .005

R4 220K

C2 2 MFD @ 450V

R5 2.2K

C3 .005

R6 220K

R11 10K

R-Y

+300V

SPEECH LEVEL R12 1M

R13 4K

C4 .0025

R14 1K

T1

27AM-24

R15 400 1%

R15A 100Ω AF. BAL

R16 1400 1%

R-BK

S3(c)

VOX

STBY

CAL

STBY

MAN

+300V R-Y

BL-W

BL-Y

R-Y

G-W

0-W

T-1 SOCKET

6.3AC

+300V

R7 133.3K 1%

C7

C8

R8 100K 1%

R9 100K 1%

C9

C10

R10 133.3K 1%

90° AF

BLU

T2

R19 1K AF BALANCE

R18 1K

560 R17

27A0-79

R-Y +300V

BK

BR

W

SB-1

T3

C38 .002

VOICE AMP
½ 12AX7(b)

VOICE RECT.
½ 6AL5

VOX SENS. R35 1M

R36 470K

C39 .05

R37 1K

R38 100K

R39 100K

R40 470K

R40A 1M

C40 .25

OPERATION SELECTOR S3(a,b,c)

S3(a)

R-G

R41 1M

R43 470K

+300V R-Y

R42 47K

R44 68K

-100V BR-Y

KEY

RELAY CONTROL
½ 12AX7(b)

K-1

R45 2.2K

R45A 470K

C41 8 @ 450V

3PDT RELAY
10000Ω COIL

PHONES

R46 4.7K 2W

+300V R-Y

SEE INTERN.

TERMINAL NUMBERS 1 TO 9
OF 9 PIN PLUG - IN PS-1
PHASE SHIFT NETWORK

PRE - AMP
12AX7(a)

HI-Z MIC

G-N

R-1 1M

R2 2.2K

R3 220K

C1 .005

R4 220K

C2 8 MFD @ 450V

R5 2.2K

C3 .005

R6 220K

R11 10K

R-Y

+300V

SPEECH LEVEL R12 1M

R13 4K

C4 .0025

AF DRIVER
½ 12BH7

R14 1K

DRIVER TRANS T1

27AM-24

BK

BL

R

R15 400 1%

R15A 100Ω

AF. BAL

G

R16 1400 1%

R-BK

S3(c)

PS-1

R7 133.3K 1%

C7

C8

R8 100K 1%

R9 100K 1%

C9

C10

R10 133.3K 1%

90° AF

G-W

AF MODULATOR
12AT7

BLU

R19 1K AF BALANCE

R18 1K

560 R17

27A0-79

T2

T3

R-Y +300V

MOD. TRANS.

MODU SELE

SB-1

TERMINAL NUMBERS 1 TO 9
OF 9 PIN PLUG - IN PS-1
PHASE SHIFT NETWORK

T-1 SOCKET

VOX STBY CAL STBY MAN

+300V R-Y

BL-W

BL-Y

R-Y

O-W

6.3AC

+300V

OPERATION SELECTOR S3 (a,b,c)

S3(a)

VOX

STBY

CAL

STBY

MAN

BK

VOICE AMP
½ 12AX7(b)

VOICE RECT.
½ 6AL5

C38 .002

VOX SENS. R35 1M

R36 470K

C39 .05

R37 1K

R38 100K

R39 100K

R40 470K

R40A 1M

C40 .25

RELAY CONTROL
½ 12AX7(b)

G-O

R-G

R41 1M

R43 470K

+300V R-Y

R42 47K

R44 68K

-100V BR-Y

KEY

K-1

R45 2.2K

R45A 470K

C41 8 @ 450V

3PDT RELAY 10000Ω COIL

R46 4.7K 2W

R-Y +300V

PHONES

SEE INTERNAL

BL-W

BL-Y

DULATION
ELECTOR

MASTER OSC
½ 12BH7

9000 KC

L1
RED

C12 .001

C13 .001

C14
150 MMF
5%

C15
150 MMF
5%

R20
560

+300V
R-Y

L2
GREEN

9000 KC

C11 .001

S1

SB-2

AM-PM

BK

90° RF

C16
.005

R21
1K-1W

R22
100K

MASTER
XTAL
9000 KC
± 1KC

BALANCED MODULATOR
IN48/IN51 DIODES
(MATCHED
SET OF 4)

RED
AM
CARRIER
BAL

R23
1K

C17
.005

BLACK
PM
CARRIER
BAL

R24
1K

C18
.005

(a)
(b)
(c)
(d)

C19 .001
5%

C20 .001
5%

RFC-1
.5 MH

9000 KC
L3
WHITE

9000 KC
L4
BLK

L5
BLU

C21
150 MMF
5%

C22
150 MMF
5%

MIXER
6BA7

L6 15 MC TRAP
ORANGE

C25
25 MMF

MIXER P
COIL L

C25A
3 MMF

BLU

R28
4.7K 2W

C26
.006

C27
36 MMF
5%

L7
YEL
15 MC
TRAP

C28
.006

R26
47K

R30
15K
10 W

R29
15K
10 W

C23
.006

R25
1K

S-2

VFO
C24
S3(b) .001

XTAL

R27
180Ω

XTAL

SEE
FREQ
CHART
PG. 14

K = X 1000 OHMS
M = MEGOHMS

SOME UNITS MAY HAVE .004
IN LIEU OF .006 MICA.

R47
10K

27CF44
7HY @ 150MA.

L10
200Ω

+300V
R-Y

R-BL

H.V. RECT.
5U4G

C43
40-40
@
450V

C44

R49
100K

C45
40
@
150V

½ 6AL5

BIAS RECT.

R50
100

R48
100K

-100V
BR-Y

BL-W

BL-Y

Y-BK

OR-BK

BL-BR

C42
.25

VFO
SOCKET

BR-Y

-100V

8V
RF
MAX.

BL-BR

-100V ON STBY
GND ON XMIT.

R47A
220K

+300V X
FIL.

Y
X
FIL.

G-BK

SPARES

RECVR.
OUTPUT TRANS

SPKR.

-100V ON STBY
TO GND ON XMIT
BY ACTION OF
RELAY K-1

REAR TERMINAL STRIP #1 TO 10

DULATION
ELECTOR

MASTER OSC
½ 12BH7

9000 KC

L1
RED

C12 .001

C13 .001

C14
150 MMF
5%

C15
150 MMF
5%

R20
560

+300V
R-Y

L2
GREEN

9000 KC

C11 .001

S1

SB-2

AM-PM

BK

90° RF

C16
.005

R21
1K-1W

R22
100K

MASTER
XTAL
9000 KC
± 1KC

RED
AM
CARRIER
BAL

R23
1K

C17
.005

BALANCED MODULATOR
1N48/1N51 DIODES
(MATCHED
SET OF 4)

(a)
(b)
(c)
(d)

C19 .001
5%

C20 .001
5%

RFC-1
.5 MH

C18
.005

BLACK
PM
CARRIER
BAL

R24
1K

9000 KC
L3
WHITE

9000 KC
L4
BLK

L5
BLU

C21
150 MMF
5%

C22
150 MMF
5%

L6 15 MC TRAP
ORANGE

C25
25 MMF

MIXER
6BA7

MIXER P
COIL L

C25A
3MMF

BLU

R28
4.7K 2W

C26
.006

C27
36 MMF
5%

L7
YEL

15 MC
TRAP

C28
.006

R30
15K
10 W

R29
15K
10 W

R26
47K

C23
.006

R25
1K

S-2

VFO
C24
S3(b) .001

XTAL

R27
180Ω

XTAL

SEE
FREQ
CHART
PG. 14

R47
10K

BLU-BR

K = X 1000 OHMS
M = MEGOHMS

SOME UNITS MAY HAVE .004
IN LIEU OF .006 MICA.

27CF44
7HY @ 150 MA.

L10
200Ω

R-BL

H.V. RECT.

5U4G

+300V
R-Y

C43
40-40
@
450V

C44

C45
40
@
150V

R49
100K

R48
100K

½ 6AL5

BIAS RECT.

R50
100

-100V

BR-Y

BL-W

BL-Y

Y-BK

OR-BK

BL-BR

C42
.25

VFO
SOCKET

BR-Y

-100V

8V
RF
MAX.

+300V
FIL.

X
FIL.

-100V ON STBY
GND ON XMIT.

R47A
220K

-100V ON STBY
TO GND ON XMIT
BY ACTION OF
RELAY K-1

SPARES

REAR TERMINAL STRIP 1 TO 10

RECVR.
OUTPUT TRANS

SPKR.

DULATION
LECTOR

MASTER OSC
½ 12BH7

9000 KC

L1
RED

C12 .001

C13 .001

C14
150 MMF
5%

R-W

90° RF

C15
150 MMF
5%

R20
560

+300V
R-Y

L2
GREEN

C16
.005

R21
1K-1W

R22
100K

MASTER
XTAL
9000 KC
± 1KC

C11 .001

9000 KC

S1

SB-2

AM-PM

BK

RED
AM
CARRIER
BAL

R23
1K

C17
.005

BLACK
PM
CARRIER
BAL

R24
1K

C18
.005

BALANCED MODULATOR
IN48/IN51 DIODES
(MATCHED
SET OF 4)

(a)
(b)
(c)
(d)

C19 .001
5%

RFC-1
.5 MH

C20 .001
5%

9000 KC
L3
WHITE

9000KC
L4
BLK

L5
BLU

C21
150 MMF
5%

C22
150 MMF
5%

MIXER
6BA7

L6 15 MC TRAP
ORANGE

C25
25 MMF

MIXER P
COIL L

C25A
3 MMF

BLU

R28
47K 2W

R26
47K

C26
.006

C27
36 MMF
5%

L7
YEL
15 MC
TRAP

C28
.006

R29
15K
10 W

R30
15K
10 W

R25
1K

C23
.006

S-2

VFO
C24
S3(b) .001

XTAL

R27
180Ω

XTAL

SEE
FREQ
CHART
PG. 14

R47
10K

K = X 1000 OHMS
M = MEGOHMS

SOME UNITS MAY HAVE .004
IN LIEU OF .006 MICA.

BL-W

BL-Y

Y-BK

BL-BR

OR-BK

C42
.25

VFO
SOCKET

BR-Y

-100V

8V
RF
MAX.

-100V ON STBY
GND ON XMIT.

R47A
220K

+300V X
FIL.

X
FIL.

SPARES

-100V ON STBY
TO GND ON XMIT
BY ACTION OF
RELAY K-1

REAR TERMINAL STRIP 1 TO 10

RECVR.
OUTPUT TRANS

SPKR.

27CF44
7HY @ 150MA.

L10
200Ω

R-BL

H.V. RECT.

+300V
R-Y

C43
40-40
@
450V

C44

5U4G

G-BK

R48
100K

R49
100K

C45
40
@
150V

½ 6AL5

BIAS RECT.

R50
100

-100V
BR-Y

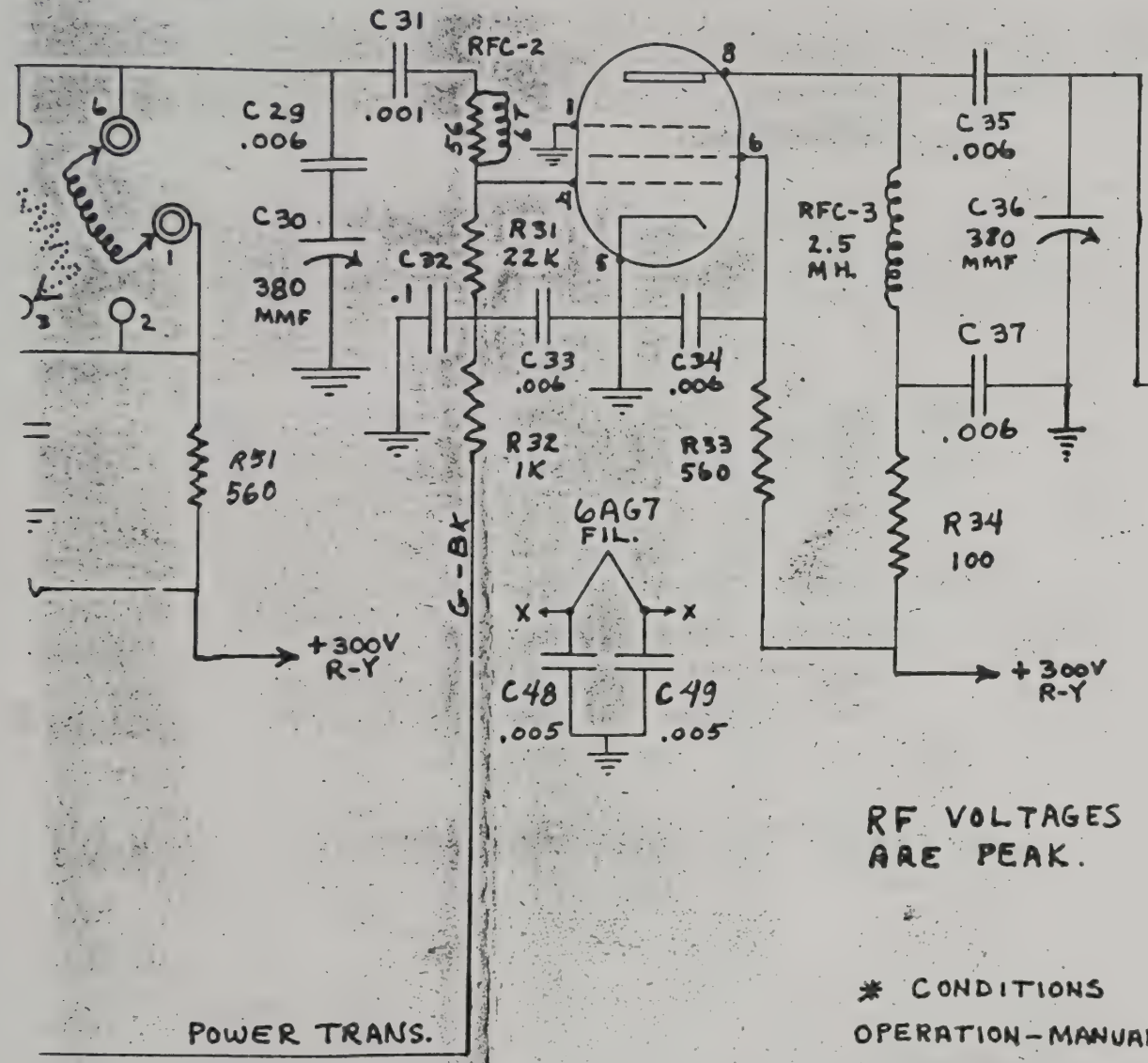
IXER PLUG-IN
OIL L-8

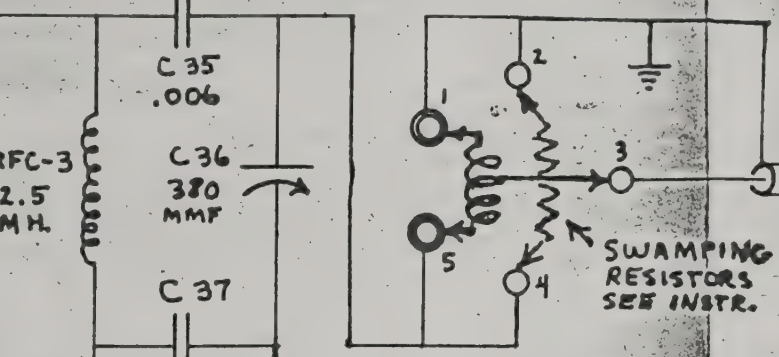
POWER AMPLIFIER
6AG7

AMPLIFIER PLUG-IN
COIL L-9

PLUG-IN COIL COLOR CODE

160	WHITE	20	GREEN
80	RED	15	BLUE
40	YELLOW	10	SLATE





RF VOLTAGES
ARE PEAK.

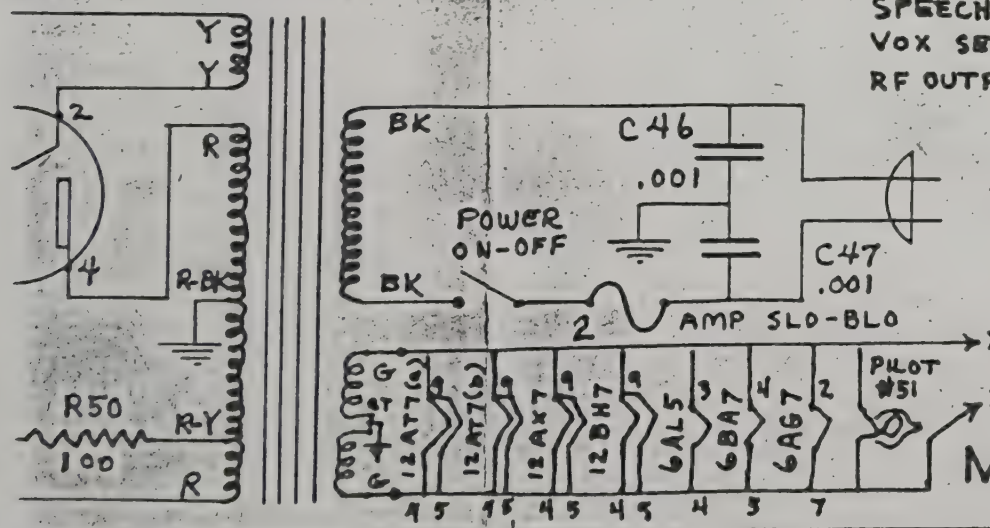
* CONDITIONS
OPERATION - MANUAL
AM CARRIER - MAX
SPEECH LEVEL - OFF
VOX SENS - OFF
RF OUTPUT - 4 MC

ALL DC AC + RF = VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AX7 (a) PREAMP	200	0	1.9	3.15 AC	3.15 AC	130	0	1.4	3.15 AC
12BH7 AF DRIVER MASTER OSC	260	0	10	3.15	3.15	290 ** 50 RF	-11 30 RF	18	3.15 AC
12AT7 AF MODULATOR	290	0	4	3.15	3.15	290	0	4	3.15 AC
6BA7 MIXER	80	-6 DC 8 VRF	0	3.15	3.15	0	1.6 RF	0	290 11 RF
6AG7 POWER AMP	0	3.15 AC	300	-19 DC 14 RF	0	295	3.15 AC	300 250 RF	
12AX7 (b) VOICE AMP RELAY CONTROL	240	11	11	3.15 AC	315 AC	170	0	1.1	3.15 AC
6AL5 VOICE RECT BIAS RECT	1.0	-100	3.15 AC	3.15 AC	75 AC	0	-.4		
5U4-G HV RECT.	0	315	0	280 AC	0	280 AC	0	315	

** IF XTAL STOPS OSC TURN L-2 CLOCKWISE

ECT. 27PF134



CENTRAL ELECTRONICS, INC.
2125 W. GIDDINGS ST.
CHICAGO 25, ILLINOIS U.S.A.

MULTIPHASE EXCITER #10A-98A MODEL 10-A

FOR SERIAL 611 AND ABOVE

CORR'D 9-14-54

5-11-53

~~2/4/53~~

REVISED 4/21/52

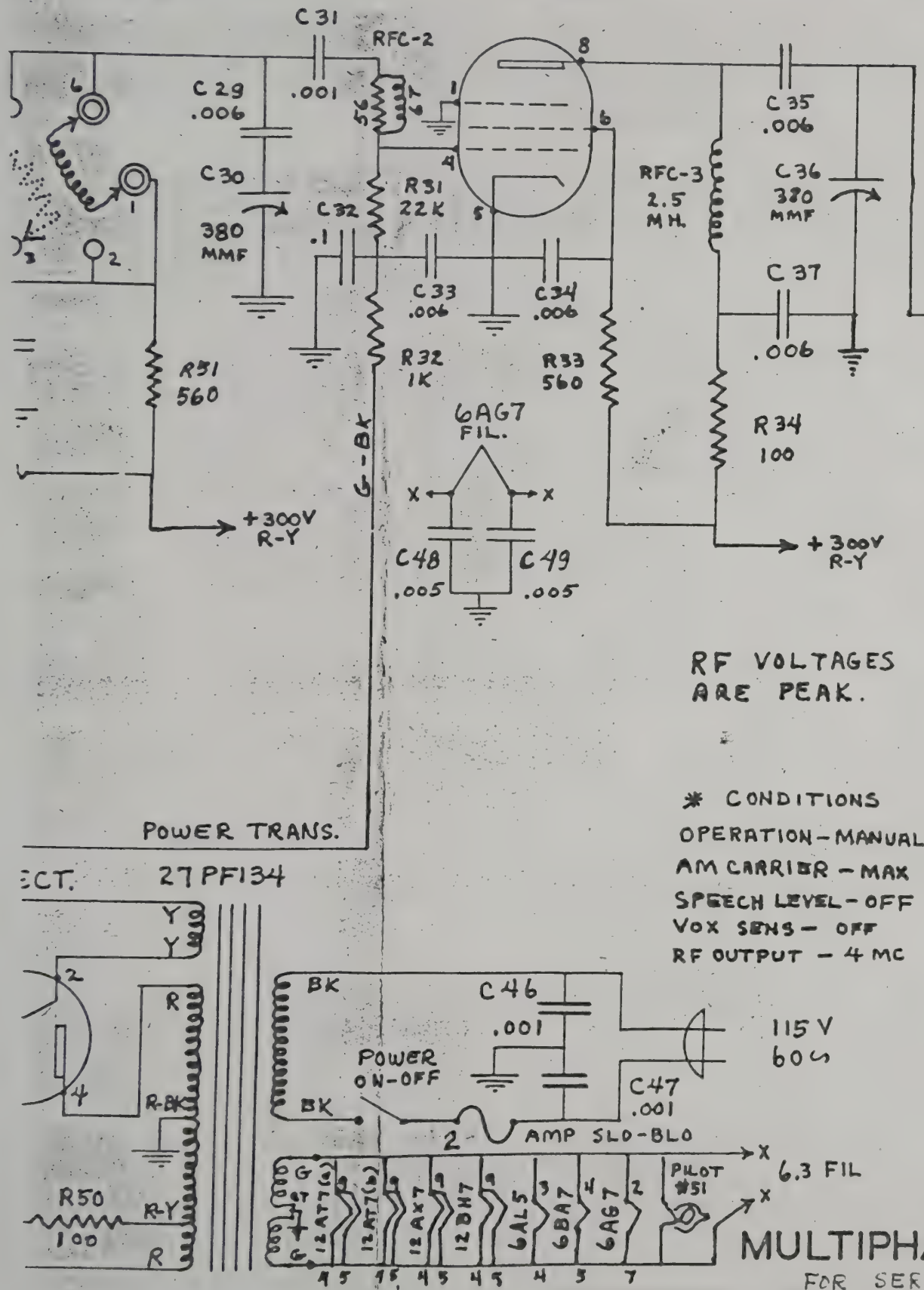
IXER PLUG-IN
OIL L-8

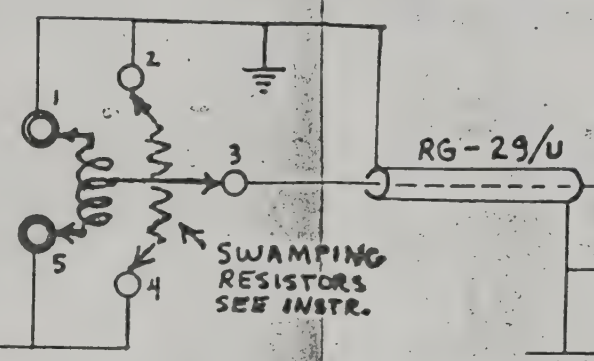
POWER AMPLIFIER
6AG7

AMPLIFIER PLUG-IN
COIL L-9

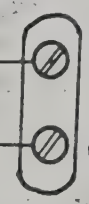
PLUG-IN COIL COLOR CODE

160	WHITE	20	GREEN
80	RED	15	BLUE
40	YELLOW	10	SLATE





RG-29/U



RF OUTPUT
52 Ω

RF VOLTAGES ARE PEAK.

* CONDITIONS
OPERATION - MANUAL
AM CARRIER - MAX
SPEECH LEVEL - OFF
VOX SENS - OFF
RF OUTPUT - 4 MC

ALL DC AC+RF = VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AX7 (a) PREAMP	200	0	1.9	3.15 AC	3.15 AC	130	0	1.4	3.15 AC
12BH7 AF DRIVER MASTER OSC	260	0	10	3.15	3.15	290 ** 50 RF	-11 30 RF	18	3.15 AC
12AT7 AF MODULATOR	290	0	4	3.15	3.15	290	0	4	3.15 AC
6BA7 MIXER	80	-6 DC 8 VRF	0	3.15	3.15	0	1.6 RF	0	290 11 RF
6AG7 POWER AMP	0	3.15 AC	300	-13 DC 14 RF	0	295	3.15 AC	300 250 RF	
12AX7 (b) VOICE AMP RELAY CONTROL	240	11	11	3.15 AC	315 AC	170	0	1.1	3.15 AC
6AL5 VOICE RECT BIAS RECT	1.0	-100	3.15 AC	3.15 AC	75 AC	0	-.4		
5U4-G HV RECT.	0	315	0	280 AC	0	280 AC	0	315	

** IF XTAL STOPS OSC TURN L-2 CLOCKWISE

ECT. 27PF134

CENTRAL ELECTRONICS, INC.
2125 W. GIDDINGS ST.
CHICAGO 25, ILLINOIS U.S.A.

MULTIPHASE EXCITER #10A-98A MODEL 10-A

FOR SERIAL 611 AND ABOVE

CORR'D 9-14-54

5-11-53

~~2/19/53~~

REVISED

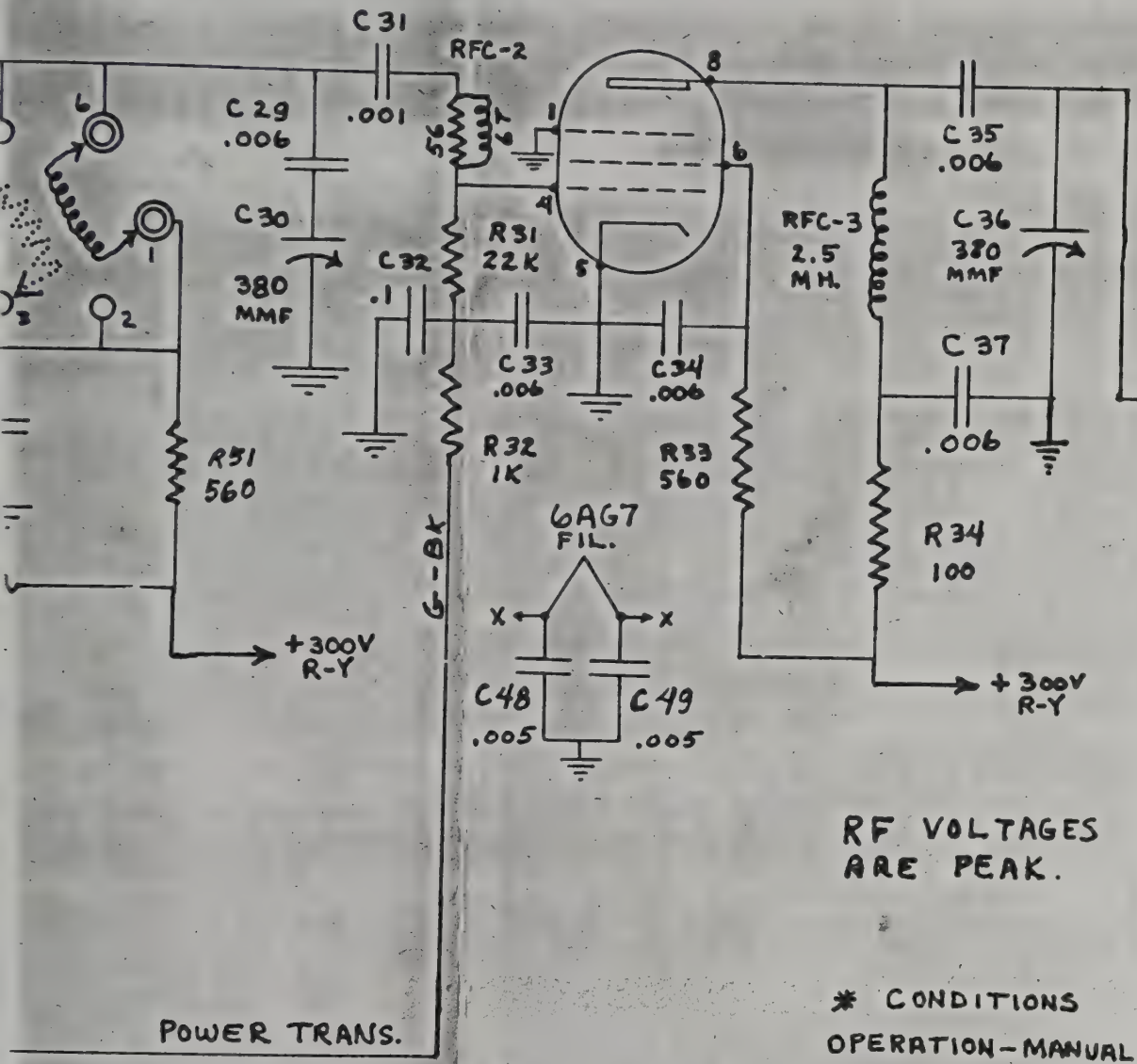
XER PLUG-IN
OIL L-8

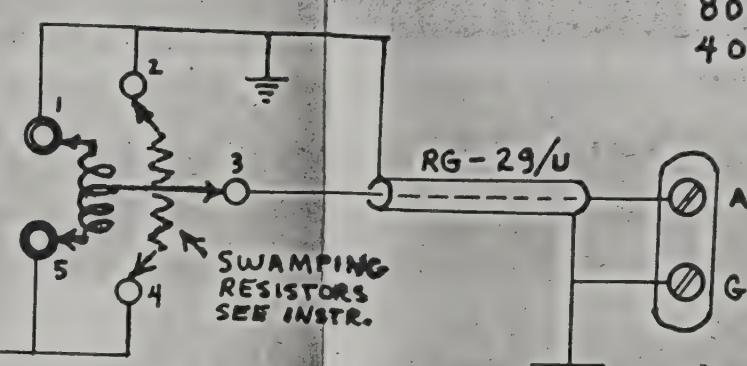
POWER AMPLIFIER
6AG7

AMPLIFIER PLUG-IN
COIL L-9

PLUG-IN COIL COLOR CODE

160	WHITE	20	GREEN
80	RED	15	BLUE
40	YELLOW	10	SLATE





RF OUTPUT
52 Ω

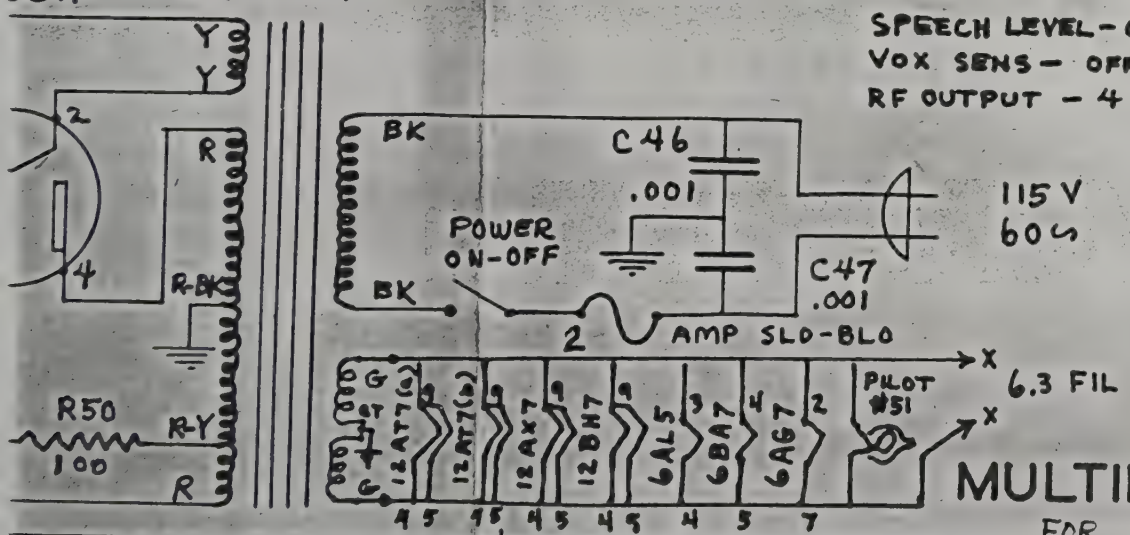
RF VOLTAGES ARE PEAK.

* CONDITIONS
OPERATION - MANUAL
AM CARRIER - MAX
SPEECH LEVEL - OFF
VOX SENS - OFF
RF OUTPUT - 4 MC

ALL DC AC + RF VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AX7 (a) PREAMP	200	0	1.9	3.15 AC	3.15 AC	130	0	1.4	3.15 AC
12BH7 AF DRIVER MASTER OSC	260	0	10	3.15	3.15	290 ** 50 RF	-11 30 RF	18	3.15 AC
12AT7 AF MODULATOR	290	0	4	3.15	3.15	290	0	4	3.15 AC
6BA7 MIXER	80	-6 DC 8V RF	0	3.15	3.15	0	1.6 RF	0	290 11 RF
6AG7 POWER AMP	0	3.15 AC	300	-19 DC 14 RF	0	295	3.15 AC	300 250 RF	
12AX7 (b) VOICE AMP RELAY CONTROL	240	11	11	3.15 AC	315 AC	170	0	1.1	3.15 AC
6AL5 VOICE RECT BIAS RECT	1.0	-100	3.15 AC	3.15 AC	75 AC	0	-.4		
5U4-G HV RECT.	0	315	0	280 AC	0	280 AC	0	315	

** IF XTAL STOPS OSC TURN L-2 CLOCKWISE



CENTRAL ELECTRONICS, INC.
2125 W. GIDDINGS ST.
CHICAGO 25, ILLINOIS U.S.A.

MULTIPHASE EXCITER #10A-98A MODEL 10-A

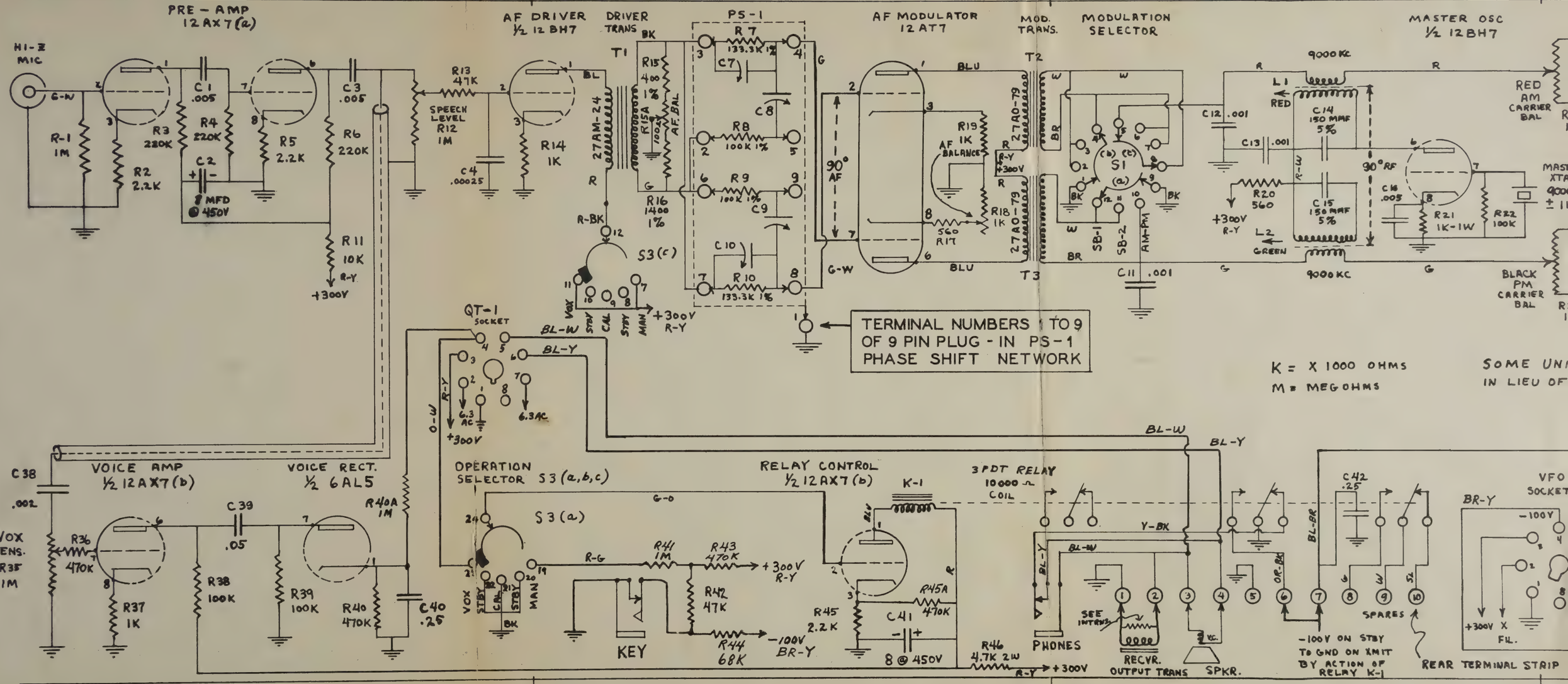
FOR SERIAL 611 AND ABOVE

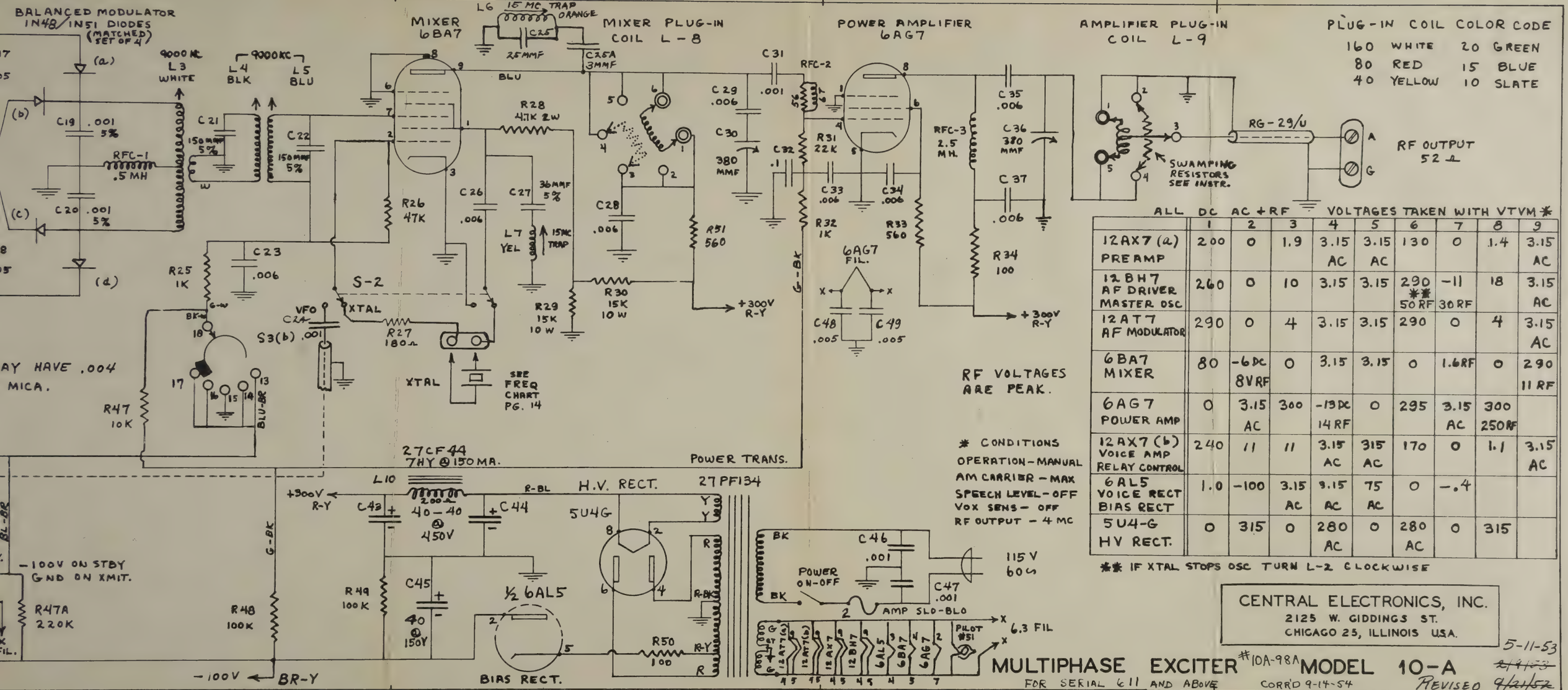
CORR'D 9-14-54

5-11-53

~~2/4/53~~

REVISED 9/21/52


PRE - AMP
12AX7(a)
HI-Z MIC
G-W
R-1 1M
R2 2.2K
R3 220K
C1 .005
R4 220K
C2 8 MFD @ 450V
R5 2.2K
C3 .005
R6 220K
R11 10K
R-Y
+300V
R13 47K
SPEECH LEVEL R12 1M
C4 .00025
AF DRIVER
½ 12BH7
R14 1K
DRIVER TRANS
T1
27AM-24
R15 400 1%
R15A 100Ω
AF. BAL
R16 1400 1%
R-BK
S3(c)
VOX
STBY
CAL
STBY
MAN
+300V R-Y
PS-1
R7 133.3K 1%
C7
C8
R8 100K 1%
R9 100K 1%
C9
C10
R10 133.3K 1%
90° AF
G-W
AF MODULATOR
12AT7
BLU
R19 1K AF BALANCE
R18 1K
560 R17
27AO-79
MOD. TRANS.
T2
T3
MODULATION SELECTOR
S1
SB-1
SB-2
AM-FM
C11 .001
MASTER OSC
½ 12BH7
9000KC
L1 RED
L2 GREEN
C12 .001
C13 .001
C14 150 MMF 5%
C15 150 MMF 5%
R20 560
+300V R-Y
30° RF
C16 .005
R21 1K-1W
R22 100K
RED AM CARRIER BAL
BLACK PM CARRIER BAL
MAST XTA
9000 ± 1
TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG - IN PS-1 PHASE SHIFT NETWORK
K = X 1000 OHMS
M = MEGOHMS
SOME UNI
IN LIEU OF
QT-1 SOCKET
BL-W
BL-Y
R-Y
6.3 AC
+300V
O-W
C38 .002
VOICE AMP
½ 12AX7(b)
VOICE RECT.
½ 6AL5
VOX SENS. R35 1M
R36 470K
C39 .05
R37 1K
R38 100K
R39 100K
R40 470K
R40A 1M
C40 .25
OPERATION SELECTOR S3(a,b,c)
S3(a)
G-O
R-G
R41 1M
R43 470K
+300V R-Y
R42 47K
R44 68K
-100V BR-Y
KEY
RELAY CONTROL
½ 12AX7(b)
K-1
R45 2.2K
R45A 470K
C41 8 @ 450V
3PDT RELAY 10000Ω COIL
R46 4.7K 2W
+300V
PHONES
SEE INTERW.
RECVR. OUTPUT TRANS
SPKR.
Y-BK
BL-BR
OR-BK
C42 .25
-100V ON STBY TO GND ON XMIT BY ACTION OF RELAY K-1
SPARES
REAR TERMINAL STRIP
BR-Y
VFO SOCKET
-100V
+300V
X
FIL.



	1	2	3	4	5	6	7	8	9
12AX7 (a) PREAMP	200	0	1.9	3.15 AC	3.15 AC	130	0	1.4	3.15 AC
12BH7 AF DRIVER MASTER OSC	260	0	10	3.15	3.15	290 ** 50 RF	-11 30 RF	18	3.15 AC
12AT7 AF MODULATOR	290	0	4	3.15	3.15	290	0	4	3.15 AC
6BA7 MIXER	80	-6 DC 8 RF	0	3.15	3.15	0	1.6 RF	0	290 11 RF
6AG7 POWER AMP	0	3.15 AC	300	-13 DC 14 RF	0	295	3.15 AC	300 250 RF	
12AX7 (b) VOICE AMP RELAY CONTROL	240	11	11	3.15 AC	315 AC	170	0	1.1	3.15 AC
6AL5 VOICE RECT BIAS RECT	1.0	-100	3.15 AC	3.15 AC	75 AC	0	-.4		
5U4-G HV RECT.	0	315	0	280 AC	0	280 AC	0	315	

PRE-AMP
12AT7 (α)

AF INPUT

AF DRIVER
1/2 6U8

DRIVER TRANS.

PS-1

AF MODULATOR
12AT7 (b)

MOD. TRANS.

HI-Z MIC.

GR-W

1M R1

2.2K R2

C1 .005

220K R3

220K R4

2.2K R5

C3 .005

220K R6

8MF C2
+ 450V −

47K R13

1M R12 SPEECH LEVEL

C4 250

2.2K R21A

27AM-24AI

BK

400 R15-1%

R15A 100 AF BAL.

1.430K R16-1%

GR

BL

R

TR-1

133.3K R7-1%

C7

C8

100K R8-1%

100K R9-1%

C9

C10

133.3K R10-1%

90° AF

GR

GR-W

BK

BL

AF BALANCE

560 R17

1K R18

1K-1W R19

TR-2

TR-3

27A079-3

W

BR

(PK) R-Y +

R-Y (PK) +300V

18

16

SW B SEC 2

14

13

BL-R

BK-R (W-BK-R)

QT-1 SOCKET

BL-W

BL-Y (W-BK-Y)

R-Y (PK)

OR-W

+300V

63V AC

10K R11

(PK) R-Y +300V.

IN SOME UNITS A .0068 IS USED IN PLACE OF A .006
IN SOME UNITS A 2.7 IS USED IN PLACE OF A 3 MMF.

ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES ( )

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK

REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY

SHIELDED WIRE

VOICE AMP
1/2 12AT7 (c)

VOICE RECT
1/2 6AL5

.002 C38

VOX GAIN 1M R35

470 K R36

.05 C39

220K R38

100K R39

1M R40A

1 OR

470K-R40

.25 C40

20 MF C76 25V

1K-R37

OPERATION SELECTOR

SW.B SEC 2

VOX

STBY

CAL

STBY

MAN

GR-OR (W-BK-BL)

(W-VL) GR-R

1M R41

470 K R43

(PK) R-Y +300V

47K R42

R-W

KEY

RELAY SENSITIVITY

68K R44

(TN) BR-Y −100V

RELAY CONTROL
1/2 12AT7 (c)

12K Ω COIL

3PDT RELAY (SH

RL

BL-W

470 K R45A

2.7K-1W R45 5%

8MF C41 450 V

R46 4.7 K-2W

W-BK-VL

W-BK-Y

PHONE

R-Y (PK) +30

AF MODULATOR

12AT7 (b)

MOD. TRANS.

AF BALANCE

560 R17

1K R18

1K-1W R19

27A079-3

TR-2

TR-3

90° AF

C8

C9

S-1

33.3K 27-1%

100K 28-1%

100K 29-1%

33.3K 30-1%

BK

GR

BL

GR-W

BR

W

(PK) R-Y +300V

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK

UMPER BRATE

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY

MODULATION

AUDIO OUTPUT

SW A SEC 2

SW A SEC 1

SHOWN ON SIDE BAND I POSITION

R71 15Ω

R70 15Ω

R20 560

(PK) R-Y +300V

MASTER OSC.

1/2 6U8

9000 KC

RED L1

C12 .001

C13 .005

C14A 33

C14 120 5%

90° RF

47K-1W R72

C15 120-5%

C15A 33

(N750)

L2 9000 KC

C11 .001

.005 C89

RFC 6-2.5MH

.001 C88

C86 75 5%

C87 3

100K R22

MASTER XTAL 9000 KC. ± 1KC

SWITCHES ARE SHOWN FROM REAR.
SEC I IS NEXT TO PANEL.
K = X 1000 M = MEGOHMS
RESISTORS ARE 1/2 WATT EXCEPT AS NOTED.
DECIMAL CAPACITOR VALUES IN MFD., OTHERS IN MMFD UNLESS SHOWN OTHERWISE.

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

9000KC L3 WHITE

900C L4 BLK

A

B

1K R52 CARRIER

1K R23

C17 .005

C18 .005

R24 1K

BK-R (W-BK-R)

BL-R (VL)

(W-VL) GR-R

BK-GR (W-BK-GR)

RFC 1 .5 MH

.001 5% C19

.001 5% C20

150-5% C21

W

▲ AUDIO OUTPUT FOR OSCILLOSCOPE TRAPEZOID PATTERNS

1K-R25

.005 C23

BK-W

GR-W (W-B

BL-B

220K R49A

10K 5% R47

SW B SEC 1

BL-BR (W-BK-BR)

BL-OR

OPERATIC

RELAY CONTROL

1/2 12AT7 (c)

12K Ω COIL

3PDT RELAY (SHOWN ENERGIZED)

RL

BL-W

(PK) R-Y +300V

RELAY SENSITIVITY

(TN) BR-Y −100V

2.7K-1W R45 5%

470 K R45A

8MF C41 450V

R46 4.7K-2W

R-Y (PK) +300 V

W-BK-VL

W-BK-Y

(W-BK-Y) BK-Y

BL-Y (W-SL)

BL-W

PHONES

SEE INSTR. BOOK

RECVR OUTPUT TRANS.

V.C.

SPKR

GOLD CONTACTS

(W-SL) BL-Y

BK-OR

(W-BK-OR)

−100V ON STBY TO GND ON XMIT BY ACTION OF RELAY RL

R77 56-1W

BL-BR (W-BK-BR)

C42 .25

GR W SL

SPARES

REAR TERMINAL STRIP 1 TO 10

VFO SOCKET

BR-Y (TN) −100 V

R-Y (PK) +300V

.005 C51

COAX

8V RF MAX.

FIL.

220K R47A

CALIBRATE LEVEL

−100V ON STBY GND ON XMIT.

(W-BK-SL)

R54 100K

33K R51A

220 K R48A

−100 V

BR-Y (TN

BALANCED MODULATOR
PLUG-IN IN34A MATCHED DIODES

MIXER
6BA7

L6- 15 MC TRAP
ORANGE
C25 25 5%
C25A

MIXER
PLUG-IN COIL
L-8

POWER AMPLIFIER
6AG7

AMPLIFIER
PLUG-IN COIL
L-9

9000KC
L3
WHITE

9000KC
L4
BLK

L5
BLU

BL

RFC1
.5 MH

.001 5% C19
.001 5% C20

150-5% C21
150 5% C22

4.7K-2W
R28

47K-R26
C52A .005
C52
180 R26A

GR-W

.006 C26

C27A 25-5%
C27B 3
13 MC TRAP
YEL L7

EXT XTAL

22K-R51B

.005 C28

10K-10W
R30

15K-10W
R29

560 R51

TUNING
380
C30

.01 C29

.001 C31

15 R73

22K R31

1K-1W R32

560 R33

100 R34

RFC-2
6T
56

.01 C35

C34B .005

RFC 3
2.5 MH

TUNING
380
C36

C32
C33 .005
C34 .005
C37 .005

2T #20-1/8" DIA.

4.7K 2W

(PK)
R-Y
+300V

(PK)
R-Y
+300V

6AG7
FIL.

.005 C48
.005 C49

*22K USED IN ALL COILS EXCEPT 10M.

*CONDITIONS
OPERATION = MANUAL
CARRIER = MAX
SPEECH LEVEL = OFF
VOX SENS = OFF
RF OUTPUT = 4 MC

ALL

12A
PRE
6U8
AF I
MAS
12AT
AF M
6BA
MIXE
6AG
POWE
12AT
VOICE
RELA
6AL5
VOICE
BIAS
5U4
H V F
RF VO
* WITH
REV. I
REV. 2
FOR RFC2 REV. 4
PRE
F 6
NO. 13
MOD.C

BK-GR (W-BK-GR)

T FOR
PE
ATTERNS

1K-R25
.005 C23

BK-W
GR-W (W-BK-BR)
BL-BR

220K R49A

10K 5% R47

BL-BR (W-BK-BR)
BL-OR

SW B
SEC I

OPERATION

GR

180 R27

SW C

SHOWN IN VFO POSITION

.001 C24

XTAL-VFO

ALTERNATE FILTER CHOKE
27CF103 - 4H - 210 MA
100Ω DC

27CF44

L10
7H-150 MA
200Ω

POWER TRANS

ALTERNATE POWER TRANSFORMER- 27PF274

BL-R (VL) HV RECT.

27PF134-1

CALIBRATE LEVEL

(W-BK-SL)

R54 100K
33K
R51A

220K
R48A

100K-5% R48

(W-BK-GR)
BK-GR

GR

R-Y (PK)

+300V

C43 40 MF 40 C44
450V

100K-R49

40MF 150V
C45

1/2 6AL5

BIAS RECT

100 R50

5U4GA

BK-R

R-Y

R

Y

Y

R

BK

W-BK-V

POWER ON-OFF

2A. FUSE SLO-BLO

.005 C46
.005 C47

115 V 60 ~

W-BK-Y

GR

CT

12AT7(a)

12AT7(b)

12AT7(c)

6U8

6AL5

6BA7

6AG7

#51 PILOT

ALL FIL LEAD PAIRS ARE BR & Y

-100V ON STBY
GND ON XMIT.

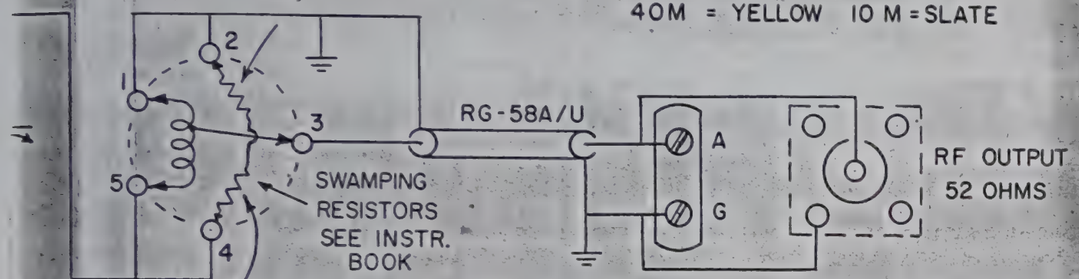
-100 V

BR-Y (TN)

AMPLIFIER
PLUG-IN COIL
L-9

PLUG-IN COIL COLOR CODE

160 M = WHITE	20 M = GREEN
80 M = RED	15 M = BLUE
40 M = YELLOW	10 M = SLATE



ALL DC, AC, & RF VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AT7 (a) PREAMP	120	0	2.1	3.15 AC	3.15 AC	120	0	2.1	3.15 AC
6U8 AF DRIVER MASTER OSC.	320	−8 11	200 1.5	"	"	320 27 RF	0	8.5	0
12AT7 (b) AF MODULATOR	320	0	4.2	"	"	320	0	4.2	3.15 AC
6BA7 MIXER	100	-5.6 DC 6.4 RF	2	"	"	0	-0.3 4.5 RF *	0	330 13 RF
6AG7 POWER AMP	0	3.15 AC	330	-15 DC 18 RF	0	330	3.15 AC	320 200 RF	
12AT7 (c) VOICE AMP RELAY CONTROL	180	30	32	3.15 AC	3.15 AC	70	0	1.0	3.15 AC
6AL5 VOICE RECT BIAS RECT	0.4	−110	3.15 AC	3.15 AC	89 AC	0	-0.1		
5U4G H V RECT	0	330	0	340 AC	0	340 AC	0	330	

RF VOLTAGES ARE PEAK, MULTIPLY BY .707 FOR RMS
* WITH COIL REPEAKED

ITIONS

ION = MANUAL
R = MAX
LEVEL = OFF
ENS = OFF
PUT = 4 MC

REV. 10-10-58
REV. 2-4-57. | REV. 7-3-57
FOR SERIAL NO. 4687 & UP
RFC2 - CER. CAPS. - R518
REV. 4-24-56
PREVIOUS REVISION 6-11-54
FOR 6U8 OSC. - FOR SERIAL
NO. 1364 & UP
MOD. CKT. COR'T. 7-19-54.

SCHEMATIC
MODEL 10 B
MULTIPHASE EXCITER

DRN 4-23-54. REDRN 3-26-56.
DRG NO. WW 201 CHKD BY

CENTRAL ELECTRONICS, INC.
1247 BELMONT AVE.
CHICAGO, 13, ILL

PRE-AMP
12AT7 (α)

AF INPUT

AF DRIVER
1/2 6U8

DRIVER TRANS.

PS-1

AF MODULATOR
12AT7 (b)

MOD. TRANS.

HI-Z MIC.

GR-W

C1 .005

C3 .005

1M R1

2.2K R2

220K R3

220K R4

2.2K R5

220K R6

8MF C2 +450V

47K R13

1M R12 SPEECH LEVEL

C4 250

2.2K R21A

27AM-24AI

400 R15

R15A AF BAL.

100 R15A

1.430K R16-1%

BK

BL

GR

R

TR-1

133.3K R7-1% C7

C8

100K R8-1%

100K R9-1%

C9

C10

133.3K R10-1%

90° AF

GR-W

BK

AF BALANCE

560 R17

1K R18

1K-1W R19

27A079-3

TR-2

TR-3

W

BR

(PK) R-Y +

BL

R-Y (PK) +300V

SW B SEC 2

BL-R

BK-R (W-BK-R)

QT-1 SOCKET

BL-W

BL-Y (W-BK-Y)

OR-W

R-Y (PK) +300V

BR

BK

X

Y

6.3V AC

OPERATION SELECTOR

IN SOME UNITS A .0068 IS USED IN PLACE OF A .006
IN SOME UNITS A 2.7 IS USED IN PLACE OF A 3 MMF.

ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES ( )

10K R11

(PK) R-Y +300V.

REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY

SHIELDED WIRE

.002 C38

VOICE AMP
1/2 12AT7 (c)

VOICE RECT
1/2 6AL5

VOX GAIN

1M R35

470 K R36

20 MF C76 25V

1K-R37

.05 C39

220K R38

100K R39

1 OR

470K-R40

.25 C40

1M R40A

SW.B SEC 2

VOX

STBY

CAL

STBY

MAN

GR-OR (W-BK-BL)

(W-VL) GR-R

1M R41

470 K R43

(PK) R-Y +300V

RELAY SENSITIVITY

47K R42

R-W

KEY

68K R44

(TN) BR-Y -100V

RELAY CONTROL
1/2 12AT7 (c)

12K Ω COIL

3PDT RELAY (SH

RL

BL-W

2.7K-1W R45 5%

470 K R45A

8MF C41 450V

R46 4.7K-2W

W-BK-VL

W-BK-Y

PHONE

R-Y (PK) +30

AF MODULATOR

12AT7 (b)

MOD. TRANS.

MODULATION

MASTER OSC.

1/2 6U8

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

AUDIO OUTPUT

9000 KC

AF BALANCE

SW A SEC 2

SW A SEC 1

SHOWN ON SIDE BAND I POSITION

MASTER XTAL 9000 KC. ± 1 KC

9000 KC

L3 WHITE

L4 BLK

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY

SWITCHES ARE SHOWN FROM REAR. SEC I IS NEXT TO PANEL.
K = X 1000 M = MEGOHMS
RESISTORS ARE 1/2 WATT EXCEPT AS NOTED.
DECIMAL CAPACITOR VALUES IN MFD., OTHERS IN MMFD UNLESS SHOWN OTHERWISE.

▲ AUDIO OUTPUT FOR OSCILLOSCOPE TRAPEZOID PATTERNS

RELAY CONTROL

1/2 12AT7 (c)

12K Ω COIL

3PDT RELAY (SHOWN ENERGIZED)

GOLD CONTACTS

SPARES

REAR TERMINAL STRIP 1 TO 10

VFO SOCKET

CALIBRATE LEVEL

OPERATIC

-100V ON STBY
GND ON XMIT.

-100V ON STBY TO GND ON XMIT BY ACTION OF RELAY RL

SEE INSTR. BOOK

PHONE

RECVR OUTPUT TRANS.

SPKR

FIL.

-100 V

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

9000KC L3 WHITE

9000KC L4 BLK — L5 BLU

MIXER 6BA7

L6- 15 MC TRAP

ORANGE

C25 25 5%

C25A

MIXER PLUG-IN COIL L-8

POWER AMPLIFIER

6AG7

RFC-2 6T 56

AMPLIFIER PLUG-IN COIL L-9

BL-R (VL)

RFC1 .5 MH

.001 C19

5% .001 C20

150-5% C21

150 5% C22

W

BL

4.7K-2W R28

22K-R51B

.001 C31

15 R73

22K R31

C34B .005

.005 C33

.005 C34

RFC 3 2.5 MH

TUNING 380 C36

.01 C35

.005 C37

2T #20-1/8" DIA.

4.7K 2W

ALL

12A PRE

6U8 AF

MAS

12AT AF M

6BA MIXE

6AG POWE

12AT VOICE RELA

6AL VOICE BIAS

5U4 HV F

RF VC

* WITH

REV.

REV.

FOR RFC2 REV.

PRE FC NO. 13 MOD.C

GR-W

47K-R26

C52A .005

180 R26A

.005 C52

.006 C26

C27A .25-5%

C27B 13 MC TRAP

YEL L7

.01 C29

TUNING 380 C30

.1 C32

.005 C28

560 R51

10K-10W R30

15K-10W R29

(PK) R-Y +300V

560 R33

100 R34

1K-1W R32

BK-GR (W-BK-GN)

BK-GR (W-BK-GR)

1K-R25

.005 C23

BK-W

GR-W (W-BK-BR)

BL-BR

EXT XTAL

GR

180 R27

SW C

SHOWN IN VFO POSITION

22K USED IN ALL COILS EXCEPT 10M.

6AG7 FIL.

C48 .005

C49 .005

*CONDITIONS

OPERATION = MANUAL

CARRIER = MAX

SPEECH LEVEL = OFF

VOX SENS = OFF

RF OUTPUT = 4 MC

220K R49A

10K 5% R47

SW B SEC I

BL-BR (W-BK-BR)

BL-OR

OPERATION

GR

.001 C24

XTAL-VFO

IT FOR PE PATTERNS

ALTERNATE FILTER CHOKE 27CF103 - 4H - 210 MA 100Ω DC

27CF44

POWER TRANS

ALTERNATE POWER TRANSFORMER - 27PF274

L10 7H-150 MA 200Ω

BL-R (VL)

HV RECT.

27PF134-1

BK

W-BK-Y

W-BK-V

POWER ON-OFF

2A. FUSE SLO-BLO

115 V 60 ~

.005 C46

.005 C47

CALIBRATE LEVEL

(W-BK-SL)

R54 100K

33K R51A

220K R48A

100K-5% R48

BL-BR (W-BK-BR)

220K R47A

-100V ON STBY GND ON XMIT.

GR (W-BK-GR) BK-GR

R-Y (PK)

+300V

C43 40 MF 450 V

40 C44

100K-R49

40MF 150V C45

1/2 6AL5

BIAS RECT

5U4GA

100 R50

BK-R

R-Y

-100 V

BR-Y (TN)

12AT7(a)

12AT7(b)

12AT7(c)

6U8

6AL5

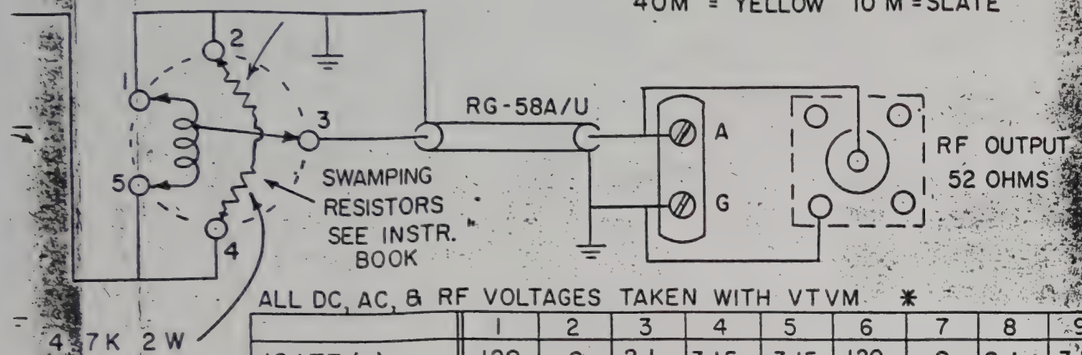
6BA7

6AG7

#51 PILOT

ALL FIL LEAD PAIRS ARE BR & Y

AMPLIFIER
PLUG-IN COIL
L-9



PLUG-IN COIL COLOR CODE

160 M = WHITE	20 M = GREEN
80 M = RED	15 M = BLUE
40 M = YELLOW	10 M = SLATE

ALL DC, AC, & RF VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AT7 (a) PREAMP	120	0	2.1	3.15 AC	3.15 AC	120	0	2.1	3.15 AC
6U8 AF DRIVER MASTER OSC.	320	−8 11	200 1.5	"	"	320 27 RF	0	8.5	0
12AT7 (b) AF MODULATOR	320	0	4.2	"	"	320	0	4.2	3.15 AC
6BA7 MIXER	100	-5.6 DC 6.4 RF	2	"	"	0	-0.3 4.5 RF *	0	330 13 RF
6AG7 POWER AMP	0	3.15 AC	330	-15 DC 18 RF	0	330	3.15 AC	320 200 RF	
12AT7 (c) VOICE AMP RELAY CONTROL	180	30	32	3.15 AC	3.15 AC	70	0	1.0	3.15 AC
6AL5 VOICE RECT BIAS RECT	0.4	-110	3.15 AC	3.15 AC	89 AC	0	-0.1		
5U4 G H V RECT	0	330	0	340 AC	0	340 AC	0	330	

RF VOLTAGES ARE PEAK, MULTIPLY BY .707 FOR RMS
* WITH COIL REPEAKED

TIONS
ION = MANUAL
R = MAX
LEVEL = OFF
ENS = OFF
PUT = 4 MC

REV. 10-10-58
REV. 2-4-57. | REV. 7-3-57
FOR SERIAL NO. 4687 & UP
RFC2 - CER. CAPS. - R518
REV. 4-24-56
PREVIOUS REVISION 6-11-54
FOR 6U8 OSC. - FOR SERIAL
NO. 1364 & UP
MOD. CKT. COR'T. 7-19-54.

SCHEMATIC
MODEL 10 B
MULTIPHASE EXCITER

DRN 4-23-54. REDRN 3-26-56.
DRG NO. WW 201 CHKD BY

CENTRAL ELECTRONICS, INC.
1247 BELMONT AVE.
CHICAGO, 13, ILL

PRE-AMP
12AT7 (α)

AF INPUT

AF DRIVER
1/2 6U8

DRIVER TRANS.

PS-1

AF MODULATOR
12AT7 (b)

MOD. TRANS.

HI-Z MIC.

GR-W

C1 .005

C3 .005

47 K R13

1M R12 SPEECH LEVEL

220K R3

220K R4

2.2K R5

220K R6

8MF C2 450V

C4 250

2.2K R21A

27AM-24AI

400 R15-1%

R15A AF BAL.

100

1.430K R16-1%

BK

GR

BL

R

TR-1

133.3K R7-1% C7

C8

100K R8-1%

100K R9-1%

C9

C10

133.3K R10-1%

90° AF

GR

GR-W

BK

AF BALANCE

560 R17

1K R18

1K-1W R19

TR-2

TR-3

27A079-3

W

BR

(PK) R-Y +

R-Y (PK) +300V

SW. B SEC 2

BL-R

BK-R (W-BK-R)

QT-1 SOCKET

BL-W

BL-Y (W-BK-Y)

OR-W

R-Y (PK) +300V

BK

63V AC

OPERATION SELECTOR

10K R11

(PK) R-Y +300V.

IN SOME UNITS A .0068 IS USED IN PLACE OF A .006
IN SOME UNITS A 2.7 IS USED IN PLACE OF A 3 MMF.

ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES ( )

REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY

SHIELDED WIRE

VOICE AMP
1/2 12AT7 (c)

VOICE RECT
1/2 6AL5

.002 C38

VOX GAIN 1M R35

470 K R36

.05 C39

BL

1 OR

1M R40A

220K R38

100K R39

470K-R40

.25 C40

20 MF C76 25V

1K-R37

RELAY CONTROL
1/2 12AT7 (c)

12K Ω COIL

3PDT RELAY (SH

GR-OR (W-BK-BL)

SW. B SEC 2

VOX STBY CAL STBY MAN

(W-VL) GR-R

1M R41

470 K R43

(PK) R-Y +300V

RELAY SENSITIVITY

47K R42

R-W

68 K R44

(TN) BR-Y —100V

KEY

BL-W

RL

2.7K-1W R45 5%

470 K R45A

8MF C41 450V

R46 4.7K-2W

R-Y (PK) +30

W-BK-VL

W-BK-Y

PHONE

AF MODULATOR

12AT7(b)

MOD. TRANS.

MODULATION

MASTER OSC.

1/2 6U8

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

AUDIO OUTPUT

9000 KC

AF BALANCE

560 R17

1K R18

1K-1W R19

TR-2

TR-3

27A079-3

90° AF

(PK) R-Y +300V

SW A SEC 2

SW A SEC 1

SHOWN ON SIDE BAND I POSITION

RED L1

C12 .001

C13 .005

C14A 33

120 C14 5%

90° RF

47K-1W R72

RFC 6-2.5MH

C89 .005

C15 120-5%

C15A 33

(N750)

C88 .001

C86 75 5%

C87 3

100K R22

9000 KC

MASTER XTAL 9000 KC. ± 1KC

R71 15Ω

R20 560

R70 15Ω

C11 .001

R52 1K CARRIER

R23 1K

C17 .005

BK-R (W-BK-R)

BL-R (VL)

(W-VL) GR-R

BK-GR (W-BK-GR)

R24 1K

C18 .005

9000KC L3 WHITE

90C L4 BLK

C19 .001 5%

C20 .001 5%

RFC1 .5 MH

C21 150-5%

W

IK-R25

C23 .005

GR-W (W-B BL-B

BK-W

220K R49A

10K 5% R47

BL-BR (W-BK-BR)

BL-OR

SW B SEC 1

OPERATIC

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY

SWITCHES ARE SHOWN FROM REAR.
SEC 1 IS NEXT TO PANEL.
K = X 1000 M = MEGOHMS
RESISTORS ARE 1/2 WATT EXCEPT AS NOTED.
DECIMAL CAPACITOR VALUES IN MFD., OTHERS IN MMFD UNLESS SHOWN OTHERWISE.

▲ AUDIO OUTPUT FOR OSCILLOSCOPE TRAPEZOID PATTERNS

RELAY CONTROL

1/2 12AT7(c)

12K Ω COIL

3PDT RELAY (SHOWN ENERGIZED)

RL

(PK) R-Y +300V

RELAY SENSITIVITY

470 K R45A

2.7K-1W R45 5%

(TN) BR-Y —100V

8MF — + C41 450V

R46 4.7K-2W

R-Y (PK) +300V

W-BK-VL

W-BK-Y

(W-BK-Y) BK-Y

BL-Y (W-SL)

BL-W

PHONE

SEE INSTR. BOOK

RECVR OUTPUT TRANS.

SPKR

V.C.

GOLD CONTACTS

BK-OR

(W-BK-OR)

—100V ON STBY TO GND ON XMIT BY ACTION OF RELAY RL

R77 56-1W

C42 .25

SPARES

REAR TERMINAL STRIP 1 TO 10

VFO SOCKET

BR-Y (TN) —100V

R-Y(PK)

C51 .005

BR

BK

+300V

X FIL.

Y X FIL.

COAX

8V RF MAX.

220K R47A

—100V ON STBY GND ON XMIT

CALIBRATE LEVEL

R54 100K

33K R51A

220 K R48A

—100 V

BR-Y (TN

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

9000KC L3 WHITE

9000KC L4 BLK L5 BLU

BL-R (VL)

RFC1 .5 MH

.001 5% C19

.001 5% C20

150-5% C21

W

W

150 5% C22

BK-GR (W-BK-GR)

1K-R25

.005 C23

BK-W

GR-W (W-8K-BR)

BL-BR

220K R49A

10K 5% R47

BL-BR (W-BK-BR)

BL-OR

SW B SEC 1

OPERATION

GR

IT FOR PE PATTERNS

MIXER 6BA7

L6-15 MC TRAP

C25 25 5%

ORANGE

C25A

BL

4.7K-2W R28

GR-W

47K-R26

C52A .005

180 R26A

.005 C52

EXT XTAL

1K-R25

180 R27

SW C

.001 C24

XTAL-VFO

.006 C26

C27A 25-5%

C27B

13 MC TRAP

YEL

22K-R51B

10K-10W R30

15K-10W R29

560 R51

.005 C28

.01 C29

TUNING 380 C30

.001 C31

MIXER PLUG-IN COIL L-8

SHOWN IN VFO POSITION

22K USED IN ALL COILS EXCEPT 10M.

(PK) R-Y +300V

ALTERNATE FILTER CHOKE 27CF103-4H-210MA 100Ω DC

POWER TRANS

27CF44

L10 7H-150MA 200Ω

BL-R (VL) HV RECT.

27PF134-1

5U4GA

Y Y R BK-R R-Y R

ALTERNATE POWER TRANSFORMER-27PF274

BK B W-BK-Y

A W-BK-V

POWER ON-OFF

2A. FUSE SLO-BLO

.005 C46

.005 C47

115 V 60 ~

GR CT GR

12AT7(a) 12AT7(b) 12AT7(c) 6U8 6AL5 6BA7 6AG7

#51 PILOT

ALL FIL LEAD PAIRS ARE BR & Y

CALIBRATE LEVEL

(W-BK-SL)

R54 100K

33K R51A

220K R48A

100K-5% R48

100K-R49

C43 40MF 450V 40 C44

40MF 150V C45

1/2 6AL5

BIAS RECT

R-Y (PK)

+300V

-100V

BR-Y (TN)

-100V ON STBY GND ON XMIT.

220K R47A

BL-BR (W-BK-BR)

POWER AMPLIFIER

6AG7

RFC-2 6T 56

.01 C35

15 R73

22K R31

C34B .005

.005 C33

.005 C34

C32

1K-1W R32

560 R33

100 R34

RFC3 2.5 MH

TUNING 380 C36

.005 C37

2T #20-1/8" DIA.

(PK) R-Y +300V

6AG7 FIL.

C48 .005

C49 .005

AMPLIFIER PLUG-IN COIL L-9

4.7K 2W

*CONDITIONS OF OPERATION = MANUAL
CARRIER = MAX
SPEECH LEVEL = OFF
VOX SENS = OFF
RF OUTPUT = 4 MC

ALL

12A PRE

6U8 AF

MAS

12AT AF M

6BA MIXE

6AG POWE

12AT VOICE RELA

6AL VOICE BIAS

5U4 HV F

RF VO * WITH

REV.

REV.

FOR RFC2 REV.

PREV FO 6

NO. 13

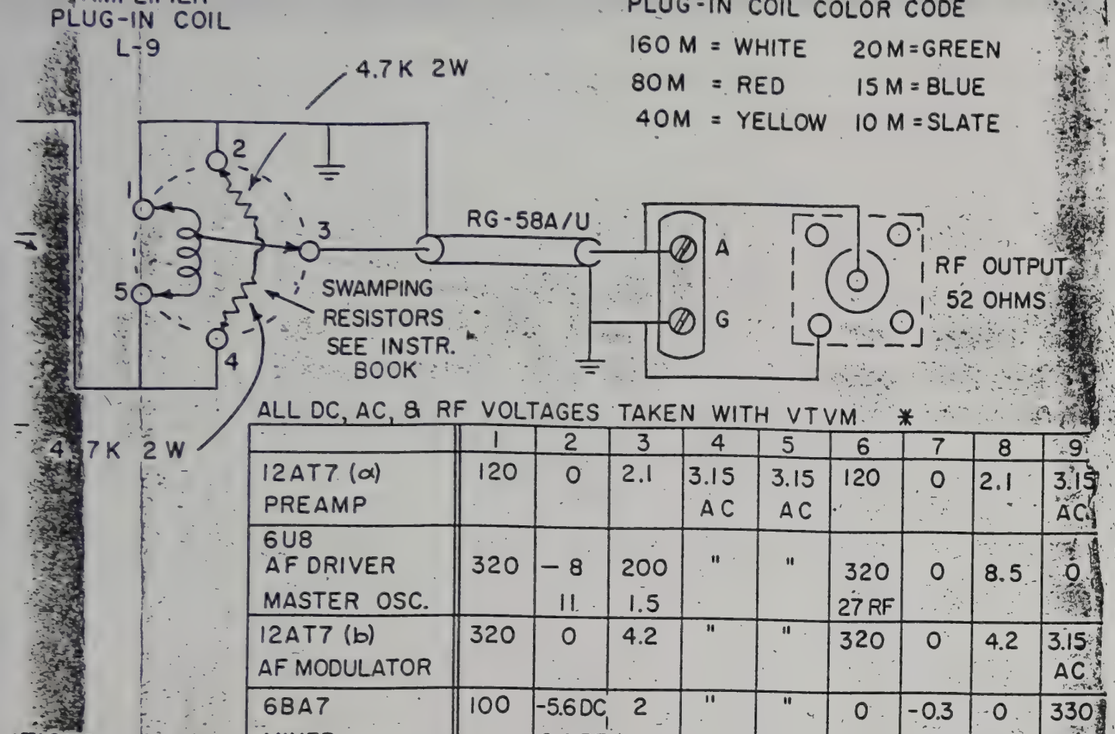
MOD.C

PLUG-IN COIL
L-9

4.7K 2W

PLUG-IN COIL COLOR CODE

160 M = WHITE 20 M = GREEN
80 M = RED 15 M = BLUE
40 M = YELLOW 10 M = SLATE



4.7K 2W

ALL DC, AC, & RF VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AT7 (a) PREAMP	120	0	2.1	3.15 AC	3.15 AC	120	0	2.1	3.15 AC
6U8 AF DRIVER MASTER OSC.	320	−8 11	200 1.5	"	"	320 27 RF	0	8.5	0
12AT7 (b) AF MODULATOR	320	0	4.2	"	"	320	0	4.2	3.15 AC
6BA7 MIXER	100	-5.6 DC 6.4 RF	2	"	"	0	-0.3 4.5 RF *	0	330 13 RF
6AG7 POWER AMP	0	3.15 AC	330	-15 DC 18 RF	0	330	3.15 AC	320 200 RF	
12AT7 (c) VOICE AMP RELAY CONTROL	180	30	32	3.15 AC	3.15 AC	70	0	1.0	3.15 AC
6AL5 VOICE RECT BIAS RECT	0.4	−110	3.15 AC	3.15 AC	89 AC	0	−0.1		
5U4 G H V RECT	0	330	0	340 AC	0	340 AC	0	330	

RF VOLTAGES ARE PEAK, MULTIPLY BY .707 FOR RMS
* WITH COIL REPEAKED

ITIONS

ION = MANUAL
R = MAX
LEVEL = OFF
ENS = OFF
PUT = 4 MC

REV. 10-10-58
REV. 2-4-57. | REV. 7-3-57
FOR SERIAL NO. 4687 & UP
RFC2 - CER. CAPS. - R51B
REV. 4-24-56
PREVIOUS REVISION 6-11-54
FOR 6U8 OSC. - FOR SERIAL
NO. 1364 & UP
MOD. CKT. COR'T. 7-19-54.

SCHEMATIC
MODEL 10 B
MULTIPHASE EXCITER

DRN 4-23-54. REDRN 3-26-56.
DRG NO. WW 201 CHKD BY

CENTRAL ELECTRONICS, INC.
1247 BELMONT AVE.
CHICAGO, 13, ILL

PRE-AMP
12AT7 (α)

AF INPUT

AF DRIVER
1/2 6U8

DRIVER TRANS.

PS-1

AF MODULATOR
12AT7 (b)

MOD. TRANS.

HI-Z MIC.

GR-W

1M R1

2.2K R2

220K R3

220K R4

2.2K R5

220K R6

C1 .005

C3 .005

8MF C2 450V

47K R13

1M R12 SPEECH LEVEL

C4 250

2.2K R21A

27AM-24A1

400 R15-1%

R15A AF BAL.

100

1,430K R16-1%

BK

GR

BL

R

TR-1

R-Y (PK) +300V

18

16

SW. B SEC 2

14

13

BL-R

BK-R (W-BK-R)

QT-1 SOCKET

BL-W

BL-Y (W-BK-Y)

OR-W

R-Y (PK) +300V

BR

BK

6.3V AC

133.3K R7-1%

100K R8-1%

100K R9-1%

133.3K R10-1%

C7

C8

C9

C10

90° AF

GR-W

AF BALANCE

560 R17

1K R18

1K-1W R19

TR-2

TR-3

27A079-3

W

BR

(PK) R-Y +

IN SOME UNITS A .0068 IS USED IN PLACE OF A .006
IN SOME UNITS A 2.7 IS USED IN PLACE OF A 3 MMF.

ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES ( )

10K R11

(PK) R-Y +300V.

REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY

SHIELDED WIRE

VOICE AMP
1/2 12AT7 (c)

VOICE RECT
1/2 6AL5

.002 C38

VOX GAIN 1M R35

470K R36

20 MF C76 25V

1K-R37

220K R38

.05 C39

100K R39

470K-R40

.25 C40

1M R40A

1 OR

OPERATION SELECTOR

+300V

SW. B SEC 2

24

23

22

20

19

VOX

STBY

CAL

STBY

MAN

GR-OR (W-BK-BL)

(W-VL) GR-R

1M R41

470K R43

(PK) R-Y +300V

RELAY SENSITIVITY

47K R42

R-W

KEY

68K R44

(TN) BR-Y —100V

RELAY CONTROL
1/2 12AT7 (c)

12K Ω COIL

3PDT RELAY (SH

RL

BL-W

2.7K-1W R45 5%

470K R45A

8MF C41 450V

R46 4.7K-2W

W-BK-VL

W-BK-Y

PHONE

R-Y (PK) +30

AF MODULATOR
12AT7(b)
MOD. TRANS.
AF BALANCE
560
R17
1K
R18
1K-1W
R19
TR-2
TR-3
27A079-3
90° AF
C8
C9
33.3K
100K
(PK) R-Y +300V
BL
GR
GR-W
BR
W
BK
TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK
♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY
UMPER
BRATE

MODULATION
AUDIO OUTPUT
SW A SEC 2
SW A SEC 1
SHOWN ON SIDE BAND I POSITION
R70 15Ω
R71 15Ω
R20 560
C11 .001
C12 .001
C13 .005
RED L1
C14A 33
C14 120 5%
C15 120-5%
C15A 33
(N750)
47K-1W R72
90° RF
GR L2
9000 KC
9000 KC R
(PK) R-Y +300V

MASTER OSC.
1/2 6U8
RFC 6-2.5MH
.001 C88
C89 .005
C86 75 5%
C87 3
100K R22
MASTER XTAL 9000 KC. ± 1KC
A
B
1K R23
C17 .005
1K R52
CARRIER
1K R24
C18 .005
BK-R (W-BK-R)
BL-R (VL)
(W-VL) GR-R
BK-GR (W-BK-GR)

BALANCED MODULATOR
PLUG-IN IN34A MATCHED DIODES
9000KC L3 WHITE
90C L4 BLK
RFC1 .5 MH
C19 .001 5%
C20 .001 5%
C21 150-5%
W

SWITCHES ARE SHOWN FROM REAR.
SEC 1 IS NEXT TO PANEL.
K = X 1000 M = MEGOHMS
RESISTORS ARE 1/2 WATT EXCEPT AS NOTED.
DECIMAL CAPACITOR VALUES IN MFD., OTHERS IN MMFD UNLESS SHOWN OTHERWISE.

▲ AUDIO OUTPUT FOR OSCILLOSCOPE TRAPEZOID PATTERNS

IK-R25
.005 C23
BK-W
GR-W (W-B
BL-B
220K R49A
10K 5% R47
SW B SEC 1
BL-BR (W-BK-BR)
BL-OR
OPERATIC

RELAY CONTROL
1/2 12AT7(c)
12K Ω COIL
3PDT RELAY (SHOWN ENERGIZED)
RL
BL-W
(PK) R-Y +300V
RELAY SENSITIVITY
(TN) BR-Y —100V
2.7K-1W R45 5%
470 K R45A
8MF C41 450V
R46 4.7K-2W
R-Y (PK) +300V
PHONE
W-BK-VL
W-BK-Y
(W-BK-Y)
BK-Y
BL-Y (W-SL)
BL-W
SEE INSTR. BOOK
RECVR. OUTPUT TRANS.
V.C.
SPKR
GOLD CONTACTS
(W-BK-OR)
—100V ON STBY TO GND ON XMIT BY ACTION OF RELAY RL
C42 .25
R77 56-1W
BL-BR (W-BK-BR)
SPARES
REAR TERMINAL STRIP 1 TO 10

VFO SOCKET
BR-Y (TN) —100V
R-Y(PK)
+300V
.005 C51
BR
BK
COAX
8V RF MAX.
FIL.
CALIBRATE LEVEL
—100V ON STBY GND ON XMIT.
220K R47A
(W-BK-SL)
R54 100K
33K R51A
220 K R48A
GR
—100 V
BR-Y (TN

BALANCED MODULATOR
PLUG-IN IN34A MATCHED DIODES

9000KC
L3 WHITE
9000KC
L4 BLK
L5 BLU

MIXER
6BA7

L6-15 MC TRAP
ORANGE
C25
25 5%
C25A

MIXER PLUG-IN COIL
L-8

POWER AMPLIFIER
6AG7

AMPLIFIER PLUG-IN COIL
L-9

RFC-2
6T
56

RFC1
.5 MH

150-5% C21
150 5% C22
.001 5% C19
.001 5% C20

4.7K-2W R28
22K-R51B
.001 C31
15 R73
.01 C29
TUNING 380 C30
22K R31
C32
C33 .005
C34 .005
C34B .005
RFC3 2.5 MH
TUNING 380 C36
.01 C35
C37 .005
560 R33
100 R34
2T*20-1/8" DIA.

47K-R26
C52A .005
180 R26A
.005 C52
GR-W
.006 C26
C27A 25-5%
C27B
13 MC TRAP
YEL
.005 C28
560 R51
10K-10W R30
15K-10W R29
1K-R25
.005 C23
EXT XTAL
BK-W
GR-W (W-BK-BR)
BL-BR
GR
180 R27
SW C
.001 C24
XTAL-VFO
SHOWN IN VFO POSITION
22K USED IN ALL COILS EXCEPT 10M.
1K-1W R32
BK-GR (W-BK-GN)
(PK) R-Y +300V
6AG7 FIL.
C48 .005
C49 .005
*CONDITIONS
OPERATION = MANUAL
CARRIER = MAX
SPEECH LEVEL = OFF
VOX SENS = OFF
RF OUTPUT = 4 MC

220K R49A
10K 5% R47
SW B SEC I
OPERATION
BL-BR (W-BK-BR)
BL-OR
GR

ALTERNATE FILTER CHOKE
27CF103 - 4H - 210 MA
100Ω DC

27CF44
7H-150 MA
L10
200Ω
C43 40 MF 40 C44
450 V
100K:R49
40MF 150V C45
220 K R48A
100K-5% R48
+300V
R-Y (PK)
1/2 6AL5
BIAS RECT
-100 V
BR-Y (TN)

CALIBRATE LEVEL
(W-BK-SL)
R54 100K
33 K R51A
-100V ON STBY
GND ON XMIT.
220K R47A
BL-BR (W-BK-BR)
BK-GR (W-BK-GR)

POWER TRANS
BL-R (VL) HV RECT
27PF134-1
5U4GA
BK-R
R-Y
100 R50
ALTERNATE POWER TRANSFORMER - 27PF274
BK
W-BK-Y
W-BK-V
POWER ON-OFF
2A. FUSE SLO-BLO
115 V 60 ~
.005 C46
.005 C47
CT
12AT7(a)
12AT7(b)
12AT7(c)
6U8
6AL5
6BA7
6AG7
PILOT
#51
ALL FIL LEAD PAIRS ARE BR & Y

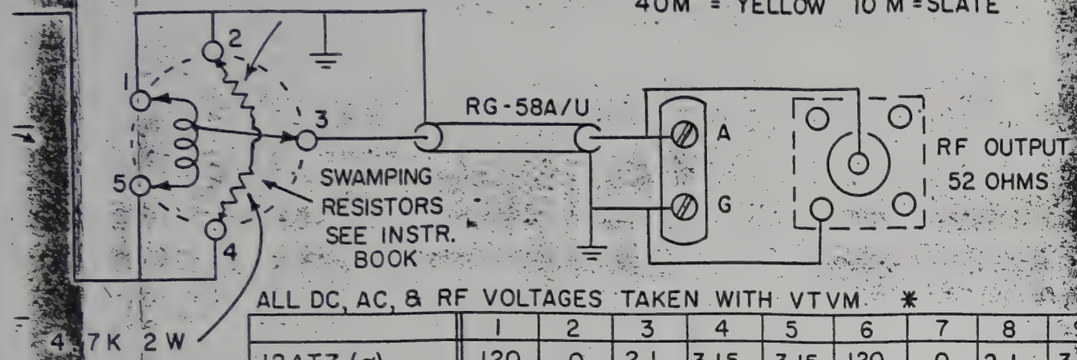
ALL
4.7K 2W
12A PRE
6U8 AF
MAS
12AT AF M
6BA MIXE
6AG POWE
12AT VOICE RELA
6AL VOICE BIAS
5U4 HV F
RF VC * WITH
REV. REV. FOR RFC2 REV. PREV FOR 6 NO. 13 MOD.C

AMPLIFIER
PLUG-IN COIL
L-9

4.7K 2W

PLUG-IN COIL COLOR CODE

160 M = WHITE 20 M = GREEN
80 M = RED 15 M = BLUE
40 M = YELLOW 10 M = SLATE



4.7K 2W

ALL DC, AC, & RF VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AT7 (a) PREAMP	120	0	2.1	3.15 AC	3.15 AC	120	0	2.1	3.15 AC
6U8 AF DRIVER MASTER OSC.	320	−8 11	200 1.5	"	"	320 27 RF	0	8.5	0
12AT7 (b) AF MODULATOR	320	0	4.2	"	"	320	0	4.2	3.15 AC
6BA7 MIXER	100	-5.6 DC 6.4 RF	2	"	"	0	-0.3 4.5 RF *	0	330 13 RF
6AG7 POWER AMP	0	3.15 AC	330	-15 DC 18 RF	0	330	3.15 AC	320 200 RF	
12AT7 (c) VOICE AMP RELAY CONTROL	180	30	32	3.15 AC	3.15 AC	70	0	1.0	3.15 AC
6AL5 VOICE RECT BIAS RECT	0.4	-110	3.15 AC	3.15 AC	89 AC	0	-0.1		
5U4G H V RECT	0	330	0	340 AC	0	340 AC	0	330	

RF VOLTAGES ARE PEAK, MULTIPLY BY .707 FOR RMS
* WITH COIL REPEAKED

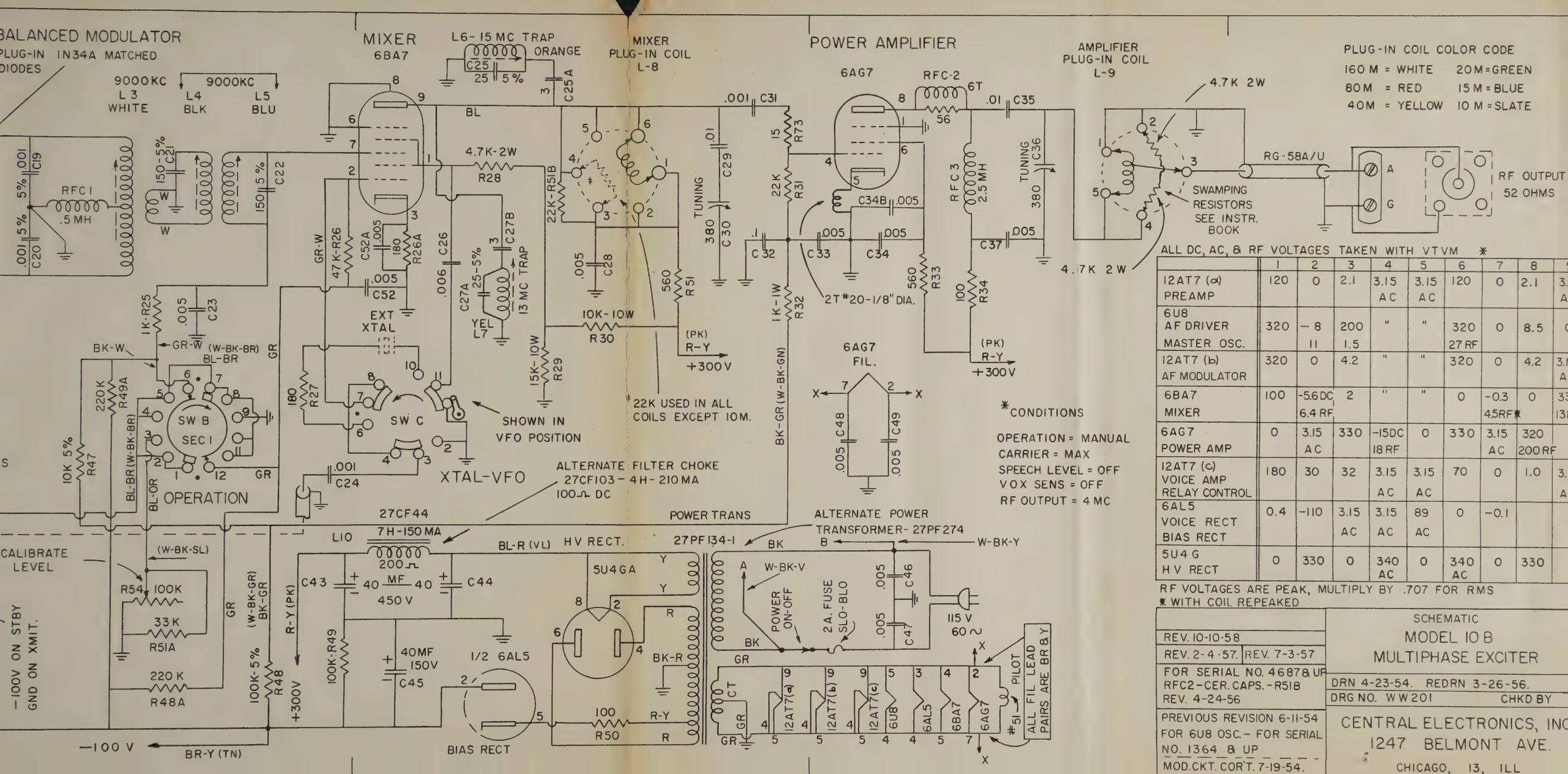
REV. 10-10-58
REV. 2-4-57. | REV. 7-3-57
FOR SERIAL NO. 4687 & UP
RFC2 - CER. CAPS. - R518
REV. 4-24-56
PREVIOUS REVISION 6-11-54
FOR 6U8 OSC. - FOR SERIAL
NO. 1364 & UP
MOD. CKT. COR'T. 7-19-54.

SCHEMATIC
MODEL 10 B
MULTIPHASE EXCITER

DRN 4-23-54. REDRN 3-26-56.
DRG NO. WW 201 CHKD BY

CENTRAL ELECTRONICS, INC.
1247 BELMONT AVE.
CHICAGO, 13, ILL

ITIONS
ION = MANUAL
R = MAX
LEVEL = OFF
ENS = OFF
PUT = 4 MC
PAINT ARE BR 3 J



ALL DC, AC, & RF VOLTAGES TAKEN WITH VTVM *

	1	2	3	4	5	6	7	8	9
12AT7 (a) PREAMP	120	0	2.1	3.15 AC	3.15 AC	120	0	2.1	3.15 AC
6U8 AF DRIVER MASTER OSC.	320	-8 11	200 1.5	"	"	320 27 RF	0	8.5	
12AT7 (b) AF MODULATOR	320	0	4.2	"	"	320	0	4.2	3.15 AC
6BA7 MIXER	100	-5.6 DC 6.4 RF	2	"	"	0	-0.3 4.5 RF*	0	33 131
6AG7 POWER AMP	0	3.15 AC	330	-15 DC 18 RF	0	330	3.15 AC	320 200 RF	
12AT7 (c) VOICE AMP RELAY CONTROL	180	30	32	3.15 AC	3.15 AC	70	0	1.0	3.15 AC
6AL5 VOICE RECT BIAS RECT	0.4	-110	3.15 AC	3.15 AC	89 AC	0	-0.1		
5U4G H V RECT	0	330	0	340 AC	0	340 AC	0	330	

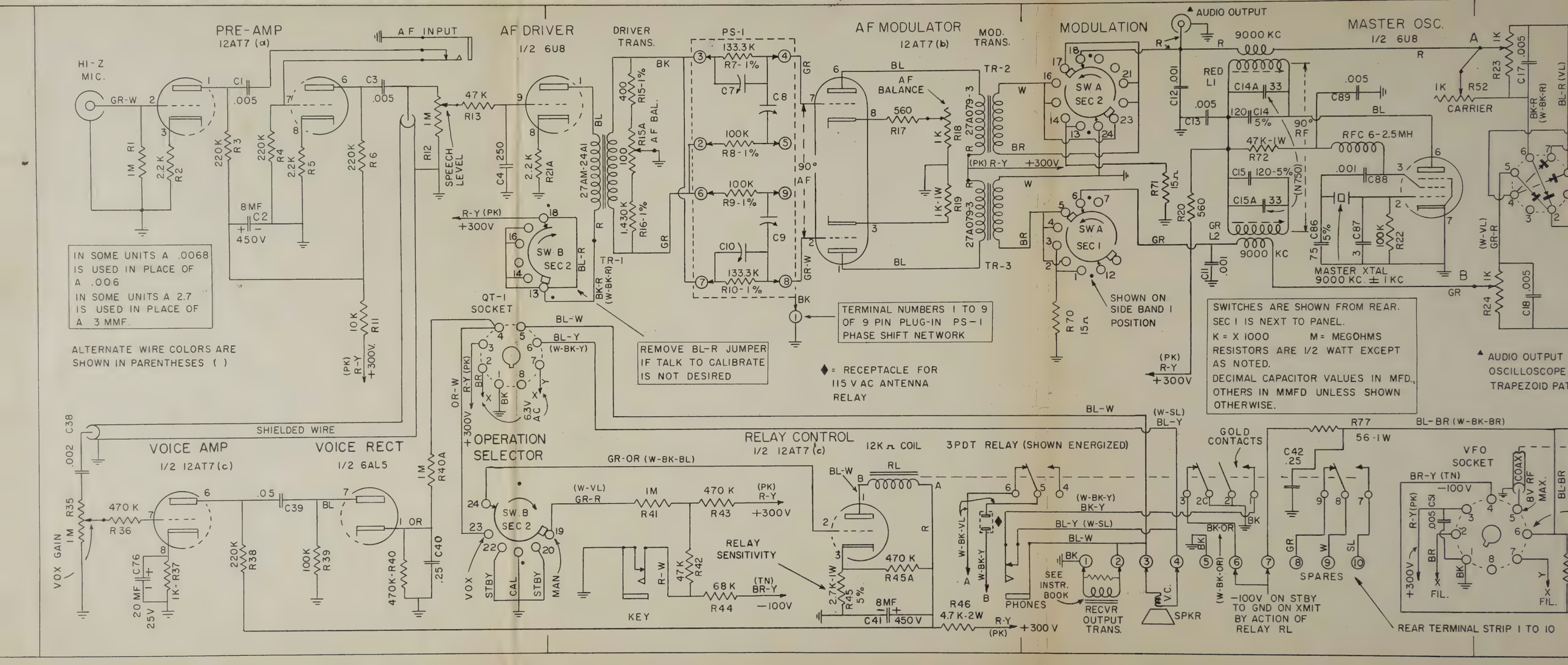
RF VOLTAGES ARE PEAK, MULTIPLY BY .707 FOR RMS
* WITH COIL REPEAKED

REV. 10-10-58
REV. 2-4-57. REV. 7-3-57
FOR SERIAL NO. 46878 UP RFC2-CER. CAPS.-R51B REV. 4-24-56
PREVIOUS REVISION 6-11-54 FOR 6U8 OSC.- FOR SERIAL NO. 1364 & UP
MOD. CKT. COR'T. 7-19-54.

SCHEMATIC
MODEL 10 B
MULTIPHASE EXCITER

DRN 4-23-54. REDRN 3-26-56.
DRG NO. WW 201 CHK'D BY

CENTRAL ELECTRONICS, INC
1247 BELMONT AVE.
CHICAGO, 13, ILL


PRE-AMP
12AT7 (a)
AF INPUT
AF DRIVER
1/2 6U8
DRIVER TRANS.
PS-1
AF MODULATOR
12AT7 (b)
MOD. TRANS.
MODULATION
AUDIO OUTPUT
MASTER OSC.
1/2 6U8
HI-Z MIC.
GR-W
C1 .005
C3 .005
47 K R13
SPEECH LEVEL
1M R12
1M R1
2.2K R2
220K R3
220K R4
2.2K R5
220K R6
8MF C2
450V
C4 250
2.2K R21A
27AM-24A1
400 R15-1%
R15A AF BAL.
100
1,430K R16-1%
TR-1
133.3K R7-1%
C7
C8
100K R8-1%
100K R9-1%
C9
C10
133.3K R10-1%
90° AF
AF BALANCE
560 R17
1K R18
1K-1W R19
27A079-3
TR-2
TR-3
SW A SEC 2
SW A SEC 1
SW B SEC 2
QT-1 SOCKET
R-Y (PK) +300V
BL-R
BK-R (W-BK-R)
REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED
TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG-IN PS-1 PHASE SHIFT NETWORK
♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY
SHOWN ON SIDE BAND I POSITION
9000 KC
RED LI
C14A 33
120 C14 5%
C15 120-5%
C15A 33
(N750)
47K-1W R72
RFC 6-2.5MH
.005 C89
.001 C88
100K R22
C86 75 5%
C87
MASTER XTAL 9000 KC. ± 1KC
C12 .001
C13 .005
C11 .001
R71 15Ω
R20 560
R70 15Ω
1K R52 CARRIER
R23 1K
C17 .005
R24 1K
C18 .005
SWITCHES ARE SHOWN FROM REAR.
SEC I IS NEXT TO PANEL.
K = X 1000 M = MEGOHMS
RESISTORS ARE 1/2 WATT EXCEPT AS NOTED.
DECIMAL CAPACITOR VALUES IN MFD., OTHERS IN MMFD UNLESS SHOWN OTHERWISE.
IN SOME UNITS A .0068 IS USED IN PLACE OF A .006
IN SOME UNITS A 2.7 IS USED IN PLACE OF A 3 MMF.
ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES ( )
SHIELDED WIRE
VOICE AMP
1/2 12AT7 (c)
VOICE RECT
1/2 6AL5
.002 C38
VOX GAIN 1M R35
470 K R36
.05 C39
220K R38
100K R39
470K-R40
1M R40A
.25 C40
20 MF C76 25V
1K-R37
OPERATION SELECTOR
SW B SEC 2
VOX
STBY
CAL
STBY
MAN
KEY
R-W
47K R42
68 K R44
(TN) BR-Y —100V
RELAY SENSITIVITY
1M R41
470 K R43
(PK) R-Y +300V
RELAY CONTROL
1/2 12AT7 (c)
12K Ω COIL
3PDT RELAY (SHOWN ENERGIZED)
RL
470 K R45A
2.7K-1W R45 5%
8MF C41 450V
R46 4.7 K-2W
R-Y (PK) +300 V
PHONES
SEE INSTR. BOOK
RECVR OUTPUT TRANS.
SPKR
V.C.
GOLD CONTACTS
—100V ON STBY TO GND ON XMIT BY ACTION OF RELAY RL
R77 56-1W
C42 .25
SPARES
VFO SOCKET
BR-Y (TN) —100V
8V RF MAX.
COAX
FIL.
REAR TERMINAL STRIP 1 TO 10
▲ AUDIO OUTPUT OSCILLOSCOPE TRAPEZOID PAT

HI Z MIC

AF INPUT

A F DRIVER 1/2 6U8

DRIVER TRANS

PS-1

A F MOD 12AT7(b)

MOD TRANS 27A0-79-3

AUDIO OUTPUT

(N750) C14A 33MMF

MASTER OSC 1/2 6U8

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

9000 KC

PRE-AMP 12AT7(α)

SPEECH LEVEL

SW D

INDICATOR

AF BAL

R18 1K AF BAL

MODULATION

SHOWN ON SIDEBAND I POSITION

MASTER XTAL 9000KC ±1KC

CAL. LEVEL

OPERATION

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG IN PS-1 PHASE SHIFT NETWORK

ALL DC, AC & RF VOLTAGES TAKEN WITH VTVM*

		1	2	3	4	5	6	7	8	9
12AT7 (α) PRE-AMP		112	0	1.7	3.1 AC		120	0	2	3.1 AC
6U8 AF DRIVER	DC	290	-13	155	"	"	290	0	8.5	0
MASTER OSC	RF		17	2			30			
12AT7 (b) AF MODULATOR		295	0	4	"	"	295	0	4	"
6BA7 MIXER	DC	85	-2.3	2	"	"	0	-.4	0	280
	RF		5					3.5		18
12BH7 CATH FOLL IND RECT	DC	0	-28	.8	3.1 AC	3.1 AC	280	60	75	3.1 AC
	RF			28				15	10	
2-6AG7 POWER AMP	DC	0	3.1 AC	300	-10	0	300	31 AC	300	
	RF				10				175	
12AT7 (c) VOICE AMP RELAY CONT		165	26	27	3.1 AC	3.1 AC	60	.05	.9	3.1 AC
6AL5 VOICE RECT BIAS RECT		-.5	-110	3.1 AC	3.1 AC	86 AC	0	-.15		
6E5 RF IND		3.1 AC	285	-32	315	0	3.1 AC			
5U4 G HV RECT	DC	0	315	0		0		0	315	
	AC		5 TO 8		350		350	2 — 5		

*RF VOLTAGES ARE PEAK MULTIPLY BY .707 FOR RMS

CONDITIONS
OPERATION - MANUAL
CARRIER - MAX
SPEECH LEVEL - OFF
VOX SENS - OFF
RF OUTPUT - 4 MC
IND SW - SET MAX LEVEL
IND LEVEL - MAX

REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED

*AUDIO OUTPUT FOR OSCILLOSCOPE TRAPEZOID PATTERNS

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY.

K = X 1000 OHMS
M = MEGOHMS

RESISTORS ARE ALL 1/2 WATT EXCEPT WHERE NOTED

IN SOME UNITS A .0068 IS USED IN PLACE OF .006 MF

SWITCHES ARE SHOWN FROM REAR - SEC I IS NEXT TO PANEL

IN SOME UNITS A 2.7 MMF IS USED IN PLACE OF 3 MMF.

SHIELDED WIRE

QT-1 SOCKET

OPERATION SELECTOR

VOICE AMP. 1/2 12AT7(c)

VOICE RECT 1/2 6AL5

RELAY CONTROL 1/2 12AT7(c)

3PDT RELAY (SHOWN ENERGIZED) 12K Ω COIL

CONTACTS 1 & 2 ARE GOLD

8 PEAK VOLTS RF MAX.

VFO SOCKET

CHOKE 4H. 100 Ω D.C. 210MA 27CF103

KEY

PHONES

RECVR OUTPUT TRANS

SPKR

SPARES

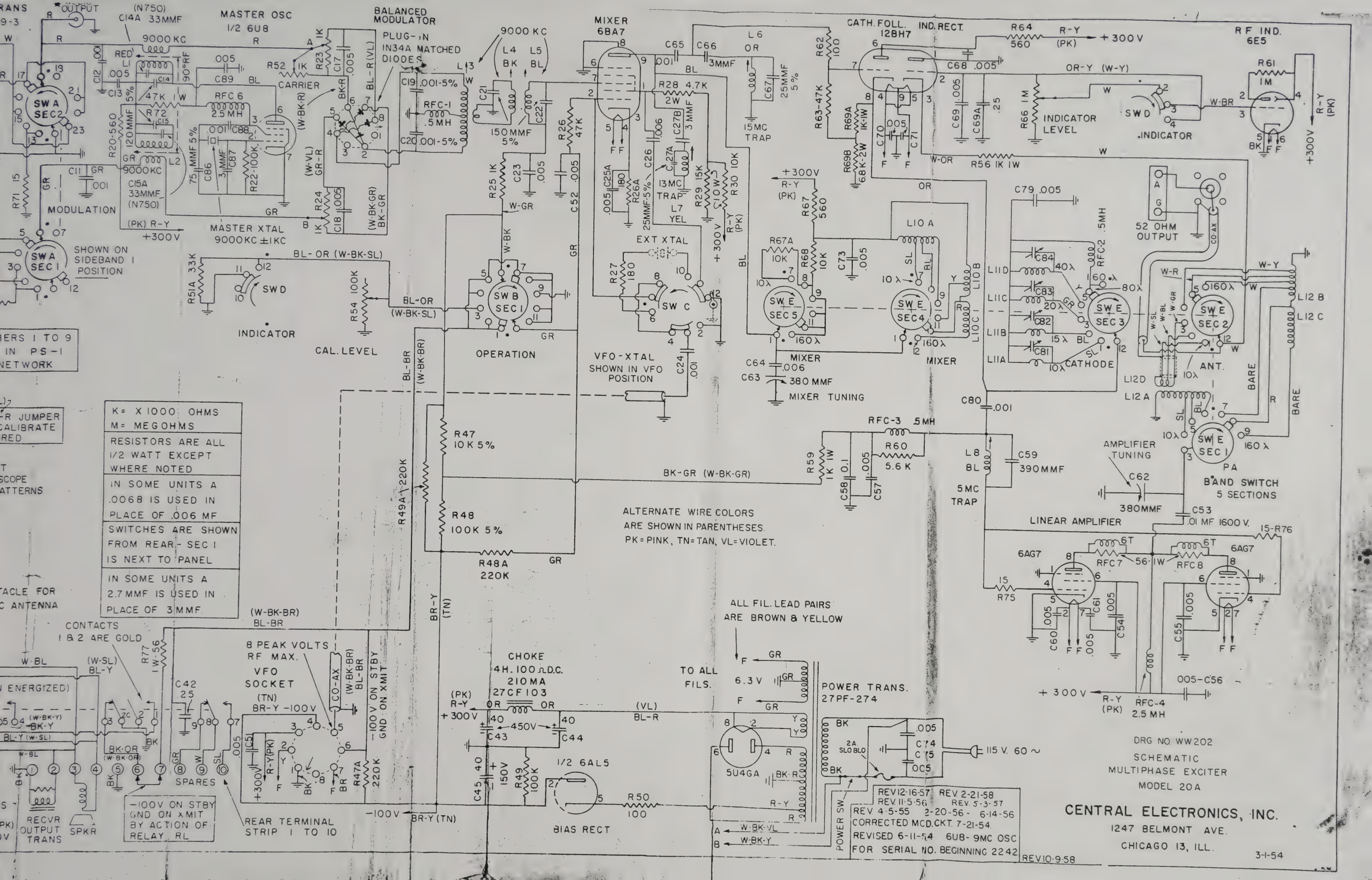
REAR TERMINAL STRIP 1 TO 10

-100V ON STBY GND ON XMIT BY ACTION OF RELAY RL

-100V ON STBY GND ON XMIT

RELAY SENSITIVITY

BIAS R


MASTER OSC
1/2 6U8
BALANCED MODULATOR
PLUG-IN IN34A MATCHED DIODES
MIXER 6BA7
CATH. FOLL. 12BH7
IND. RECT.
RF IND. 6E5
9000 KC
CARRIER
MODULATION
MASTER XTAL 9000KC ±1KC
SHOWN ON SIDEBAND I POSITION
INDICATOR
CAL. LEVEL
OPERATION
EXT XTAL
VFO-XTAL SHOWN IN VFO POSITION
MIXER
MIXER TUNING
CATHODE
ANT.
52 OHM OUTPUT
AMPLIFIER TUNING
PA
BAND SWITCH 5 SECTIONS
LINEAR AMPLIFIER
INDICATOR LEVEL
INDICATOR
5MC TRAP
15MC TRAP
13MC TRAP
K= X 1000 OHMS
M= MEGOHMS
RESISTORS ARE ALL 1/2 WATT EXCEPT WHERE NOTED
IN SOME UNITS A .0068 IS USED IN PLACE OF .006 MF
SWITCHES ARE SHOWN FROM REAR - SEC I IS NEXT TO PANEL
IN SOME UNITS A 2.7 MMF IS USED IN PLACE OF 3 MMF.
ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES.
PK = PINK, TN = TAN, VL = VIOLET.
ALL FIL. LEAD PAIRS ARE BROWN & YELLOW
CONTACTS 1 & 2 ARE GOLD
8 PEAK VOLTS RF MAX.
VFO SOCKET
CHOKE 4H. 100 Ω D.C. 210MA 27CF103
TO ALL FILS.
POWER TRANS. 27PF-274
1/2 6AL5
BIAS RECT
5U4GA
6AG7
RFC-1 .5MH
RFC-2 .5MH
RFC-3 .5MH
RFC-4 2.5 MH
RFC 6 2.5MH
RFC 7
RFC 8
REAR TERMINAL STRIP 1 TO 10
-100V ON STBY GND ON XMIT BY ACTION OF RELAY RL
+100V ON STBY GND ON XMIT
SPARES
RECVR OUTPUT TRANS
SPKR
115 V. 60 ~
POWER SW
DRG NO WW202
SCHEMATIC
MULTIPHASE EXCITER
MODEL 20A
CENTRAL ELECTRONICS, INC.
1247 BELMONT AVE.
CHICAGO 13, ILL.
3-1-54
REV 10-9-58
REV 12-16-57 REV 2-21-58
REV 11-5-56 REV 5-3-57
REV 4-5-55 2-20-56 - 6-14-56
CORRECTED MOD. CKT. 7-21-54.
REVISED 6-11-54 6U8- 9MC OSC
FOR SERIAL NO. BEGINNING 2242

OUTPUT
(N750)
C14A 33MMF
MASTER OSC
1/2 6U8
9000 KC
BALANCED MODULATOR
PLUG-IN IN34A MATCHED DIODES
9000 KC
L4 BK
L5 BL
MIXER 6BA7
L6 OR
15MC TRAP
CATH. FOLL. 12BH7
IND. RECT.
R64 560 R-Y (PK) +300 V
RF IND. 6E5
R61 1M
OR-Y (W-Y)
INDICATOR LEVEL
SWD
INDICATOR
W-BR
R-Y (PK)
+300V
SWA SEC 2
SWA SEC 1
SHOWN ON SIDEBAND I POSITION
MODULATION
MASTER XTAL 9000 KC ±1 KC
(PK) R-Y
+300V
CARRIER
RFC 6 2.5 MH
RFC-1 .5MH
150 MMF 5%
EXT XTAL
SW C
OPERATION
VFO-XTAL SHOWN IN VFO POSITION
+300V R-Y (PK)
L10 A
L10 B
L10 C
SW E SEC 5
SW E SEC 4
MIXER
MIXER TUNING
C64 .006
C63 380 MMF
52 OHM OUTPUT
CO-AX
SW E SEC 3
SW E SEC 2
SW E SEC 1
L11D
L11C
L11B
L11A
CATHODE
ANT.
L12 A
L12 B
L12 C
L12 D
BARE
PA BAND SWITCH 5 SECTIONS
AMPLIFIER TUNING
C62 380MMF
C53 .01 MF 1600 V.
LINEAR AMPLIFIER
6AG7
RFC 7
RFC 8
56-1W
15-R76
R75 15
C60
C61
C54
C55
005-C56
+300 V R-Y (PK)
RFC-4 2.5 MH
RFC-3 .5MH
R60 5.6 K
R59 1K 1W
C58 0.1
C57 .005
L8 BL
C59 390MMF
5MC TRAP
R56 1K 1W
R63-47K
R62 100
R69A 1K-1W
R69B 68K-2W
C68 .005
C69 .005
C69A .25
C70 .005
C71
R66 1M
R67 560
R67A 10K
R68 10K
C73 .005
C79 .005
R28 4.7K 2W
C27B 3 MMF
C27A
R29 15K 10W
R30 10K
R26 47K
R25 1K
C23 .005
C52 .005
C22
C21
C26 .006
C25A .005
R26A 180
25MMF 5%
R27 180
C24 .001
C65 .001
C66 3MMF
C67 25MMF 5%
C12 .005
C13 5%
C14
C15
C86
C87 3MMF
C88 .001
C89
R72 47K 1W
R20-560 120MMF
R22-100K
C11 GR .001
R71 15
C17 .005
C18 .005
R23 1K
R24 1K
C19 .001-5%
C20 .001-5%
L13
R51A 33K
SWD
INDICATOR
CAL. LEVEL
R54 100K
BL-OR (W-BK-SL)
BL- OR (W-BK-SL)
R47 10K 5%
R48 100K 5%
R48A 220K
R49A 220K
BK-GR (W-BK-GR)
ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES.
PK = PINK, TN = TAN, VL = VIOLET.
ALL FIL. LEAD PAIRS ARE BROWN & YELLOW
TO ALL FILS.
POWER TRANS. 27PF-274
6.3 V
CHOKE 4H. 100 Ω D.C. 210 MA 27CF103
C43 40 450V C44 40
C45 40 150V
R49 100K
1/2 6AL5
BIAS RECT
R50 100
-100V
BR-Y (TN)
(VL) BL-R
A W-BK-VL
B W-BK-Y
5U4GA
C74 .005
C75 .005
115 V. 60 ~
POWER SW
2A. SLO BLO
BK
BK-R
R-Y
R
Y
F
GR
OR
BL
W
W-BK
W-BK-BR
BL-BR
BR-Y
W-BL
W-SL
BL-Y
W-R
W-Y
W-GR
W-BL
SL
BK-OR
BK-Y
W-BK-Y
BK-GR
W-OR
W-VL
GR-R
BK-R
BL-R (VL)
W-BK-GR
BK-GR
CO-AX
(W-BK-BR) BL-BR
-100 V ON STBY GND ON XMIT
8 PEAK VOLTS RF MAX.
VFO SOCKET
(TN) BR-Y -100V
CONTACTS 1 & 2 ARE GOLD
ENERGIZED)
SPARES
RECVR OUTPUT TRANS
SPKR
-100V ON STBY GND ON XMIT BY ACTION OF RELAY RL
REAR TERMINAL STRIP 1 TO 10
ERS 1 TO 9 IN PS-1 ETWORK
R JUMPER ALIBRATE RED
COPE TTERNS
ACLE FOR ANTENNA
K = X 1000 OHMS
M = MEGOHMS
RESISTORS ARE ALL 1/2 WATT EXCEPT WHERE NOTED
IN SOME UNITS A .0068 IS USED IN PLACE OF .006 MF
SWITCHES ARE SHOWN FROM REAR - SEC I IS NEXT TO PANEL
IN SOME UNITS A 2.7 MMF IS USED IN PLACE OF 3 MMF
DRG NO. WW202
SCHEMATIC
MULTIPHASE EXCITER
MODEL 20A
CENTRAL ELECTRONICS, INC.
1247 BELMONT AVE.
CHICAGO 13, ILL.
3-1-54
REV 12-16-57 REV 2-21-58
REV 11-5-56 REV 5-3-57
REV 4-5-55 2-20-56 - 6-14-56
CORRECTED MOD. CKT. 7-21-54
REVISED 6-11-54 6U8- 9MC OSC
FOR SERIAL NO. BEGINNING 2242
REV 10-9-58

HI Z MIC

AF INPUT

PRE-AMP 12AT7(a)

A F DRIVER 1/2 6U8

SPEECH LEVEL

SW D

INDICATOR

DRIVER TRANS

PS-1

AF BAL

A F MOD 12AT7(b)

MOD TRANS 27A0-79-3

AUDIO OUTPUT

SWA SEC 2

SWA SEC 1

MODULATION

SHOWN ON SIDEBAND I POSITION

(N750) C14A 33MMF

9000 KC

MASTER OSC 1/2 6U8

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

CARRIER

MASTER XTAL 9000KC ±1KC

9000 KC

MIXE 6BA

150MMF 5%

SW B SEC 1

OPERATION

VFO - SHOWN POS

SW B SEC 2

OPERATION

SWD

INDICATOR

CAL. LEVEL

BL-OR (W-BK-SL)

R54 100K

R51A 33K

R25 1K

R26 47K

R47 10K 5%

R48 100K 5%

R48A 220K

R49A \ 220K

BR-Y (TN)

-100V BR-Y (TN)

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG IN PS-1 PHASE SHIFT NETWORK

ALL DC, AC & RF VOLTAGES TAKEN WITH VTVM*

		1	2	3	4	5	6	7	8	9
12AT7 (a) PRE-AMP		112	0	1.7	3.1 AC		120	0	2	3.1 AC
6U8 AF DRIVER	DC	290	-13	155	"	"	290	0	8.5	0
MASTER OSC	RF		17	2			30			
12AT7 (b) AF MODULATOR		295	0	4	"	"	295	0	4	"
6BA7 MIXER	DC	85	-2.3	2	"	"	0	-.4	0	280
	RF		5					3.5		18
12BH7 CATH FOLL IND RECT	DC	0	-28	.8	3.1 AC	3.1 AC	280	60	75	3.1 AC
	RF			28				15	10	
2-6AG7 POWER AMP	DC	0	3.1 AC	300	-10	0	300	3.1 AC	300	
	RF				10				175	
12AT7 (c) VOICE AMP RELAY CONT		165	26	27	3.1 AC	3.1 AC	60	.05	.9	3.1 AC
6AL5 VOICE RECT BIAS RECT		-.5	-110	3.1 AC	3.1 AC	86 AC	0	-.15		
6E5 RF IND		3.1 AC	285	-32	315	0	3.1 AC			
5U4 G HV RECT	DC	0	315	0		0		0	315	
	AC		5 TO 8		350		350	2 — 5		

*RF VOLTAGES ARE PEAK MULTIPLY BY .707 FOR RMS

CONDITIONS
OPERATION — MANUAL
CARRIER — MAX
SPEECH LEVEL — OFF
VOX SENS — OFF
RF OUTPUT — 4 MC
IND SW — SET MAX LEVEL
IND LEVEL — MAX

(VL)2 REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED

*AUDIO OUTPUT FOR OSCILLOSCOPE TRAPEZOID PATTERNS

K = X 1000 OHMS
M = MEGOHMS

RESISTORS ARE ALL 1/2 WATT EXCEPT WHERE NOTED

IN SOME UNITS A .0068 IS USED IN PLACE OF .006 MF

SWITCHES ARE SHOWN FROM REAR - SEC 1 IS NEXT TO PANEL

IN SOME UNITS A 2.7 MMF IS USED IN PLACE OF 3 MMF.

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY.

CONTACTS 1 & 2 ARE GOLD

8 PEAK VOLTS RF MAX.

VFO SOCKET (TN) BR-Y -100V

-100V ON STBY GND ON XMIT

CHOKE 4H. 100 Ω D.C. 210MA 27CF103

BIAS RECT

1/2 6AL5

QT-1 SOCKET

OPERATION SELECTOR

VOICE AMP. 1/2 12AT7(c)

VOICE RECT 1/2 6AL5

VOX SENS

RELAY CONTROL 3PDT RELAY (SHOWN ENERGIZED) 12K Ω COIL 1/2 12AT7(c)

KEY

PHONES

RECVR OUTPUT TRANS

SPKR

SPARES

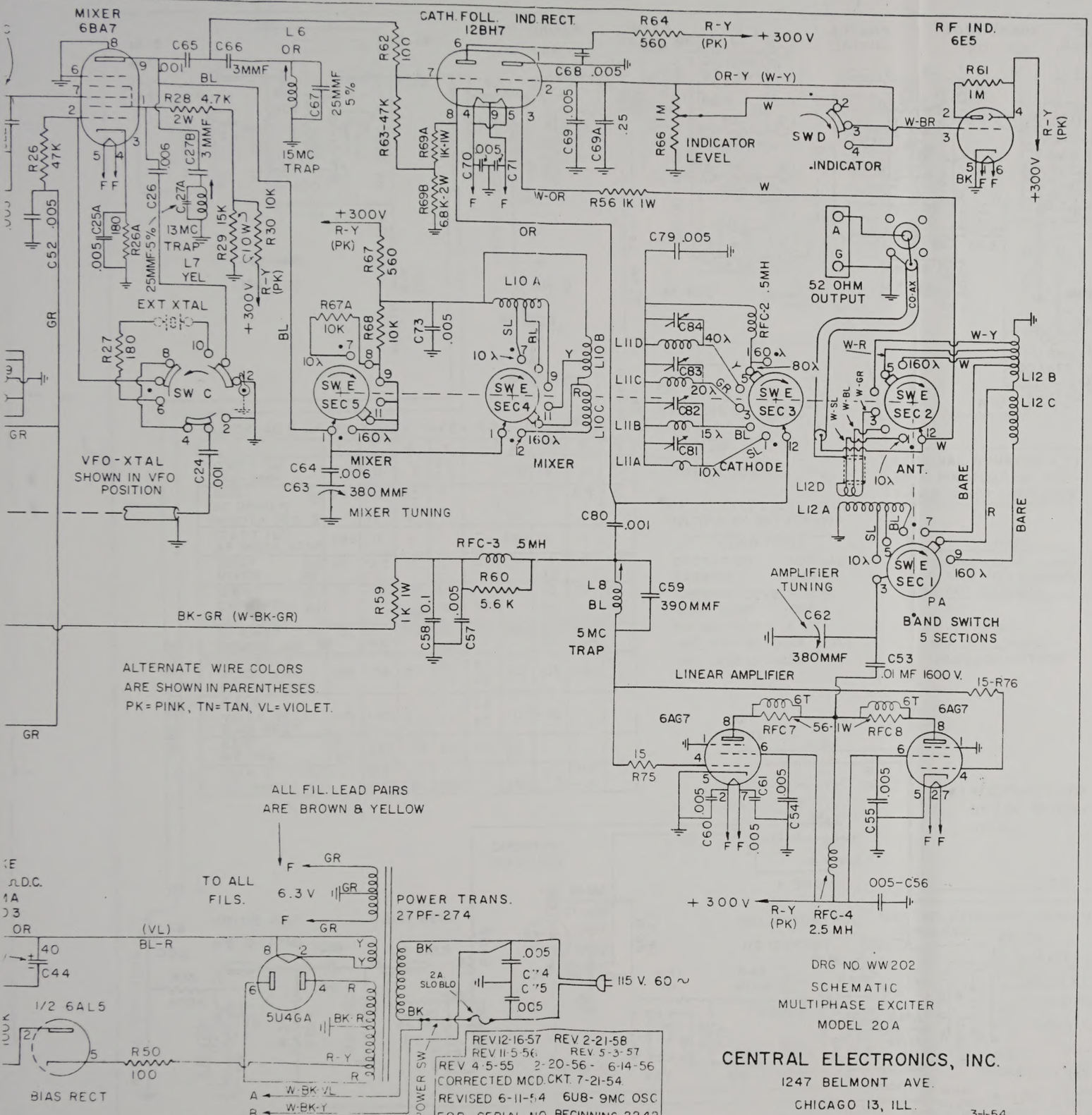
REAR TERMINAL STRIP 1 TO 10

-100V ON STBY GND ON XMIT BY ACTION OF RELAY RL

2.7K-1W RELAY SENSITIVITY

4.7K-2W

SHIELDED WIRE


MIXER 6BA7
CATH. FOLL. IND. RECT. 12BH7
R64 560 R-Y (PK) + 300 V
RF IND. 6E5
R61 1M
OR-Y (W-Y)
INDICATOR LEVEL
SW D
INDICATOR
W-BR
BK FF
+300V R-Y (PK)
L6 OR
C65 .001
C66 3MMF
C67 25MMF 5%
15MC TRAP
R62 100
R63-47K
R69A 1K-1W
R698 6.8K-2W
C70 .005
C71
C69 .005
C69A .25
R66 1M
W-OR
R56 1K 1W
R28 4.7K 2W
C27B 3MMF
C27A
13MC TRAP
L7 YEL
R29 15K
C10 W3
R30 10K
R26 47K
C25A .005
R26A 180
25MMF-5%
C26 .006
C52 .005
EXT XTAL
R27 180
SW C
VFO-XTAL SHOWN IN VFO POSITION
C24 .001
+300V R-Y (PK)
R67 560
R67A 10K
R68 10K
C73 .005
L10 A
L10 B
L10 C
SW E SEC 5
SW E SEC 4
160λ MIXER
C64 .006
C63 380 MMF
MIXER TUNING
OR
C79 .005
RFC-2 .5MH
L11D
L11C
L11B
L11A
C84 40λ
C83 20λ
C82 15λ
C81 10λ
CATHODE
SW E SEC 3
60λ
80λ
52 OHM OUTPUT
CO-AX
W-R
W-Y
W
160λ
SW E SEC 2
L12 B
L12 C
W-SL
W-BL
W-GR
ANT.
L12D
L12 A
BARE
R
SW E SEC 1
PA
AMPLIFIER TUNING
C62 380MMF
C53 .01 MF 1600 V.
BAND SWITCH 5 SECTIONS
C80 .001
RFC-3 .5MH
R60 5.6 K
R59 1K 1W
C58 0.1
C57 .005
L8 BL
5MC TRAP
C59 390MMF
BK-GR (W-BK-GR)
ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES.
PK= PINK, TN= TAN, VL= VIOLET.
LINEAR AMPLIFIER
15-R76
6AG7
6T
RFC 7
56-1W
RFC 8
R75 15
C60 .005
C61 .005
C54 .005
C55 .005
C56 .005
+ 300 V R-Y (PK)
RFC-4 2.5 MH
ALL FIL. LEAD PAIRS ARE BROWN & YELLOW
TO ALL FILS.
6.3 V
POWER TRANS. 27PF-274
C44 40
1/2 6AL5
5U4GA
R50 100
BIAS RECT
2A SLO BLO
C74
C75
.005
115 V. 60 ~
POWER SW
REV 12-16-57 REV 2-21-58
REV 11-5-56 REV 5-3-57
REV 4-5-55 2-20-56 - 6-14-56
CORRECTED MCD. CKT. 7-21-54.
REVISED 6-11-54 6U8- 9MC OSC
FOR SERIAL NO. BEGINNING 2242
REV 10-9-58
DRG NO. WW 202
SCHEMATIC
MULTIPHASE EXCITER
MODEL 20A
CENTRAL ELECTRONICS, INC.
1247 BELMONT AVE.
CHICAGO 13, ILL.
3-1-54

HI Z MIC

W-GR

AF INPUT

A F DRIVER 1/2 6U8

DRIVER TRANS

PS-1

A F MOD 12AT7(b)

MOD TRANS 27A0-79-3

AUDIO OUTPUT

(N750) C14A 33MMF

MASTER OSC 1/2 6U8

BALANCED MODULATOR

PLUG-IN IN34A MATCHED DIODES

9000 KC

MIXE 6BA7

C1 .005

C2 8-450V

C3 .005

R1 1M

R2 2.2K

R3 220K

R4 220K

R5 2.2K

R6 220K

R11 10K

+300V

R-Y (PK)

PRE-AMP 12AT7(α)

R12 1M

R13 47K

SPEECH LEVEL

C4 .00025

R21A 2.2K

SW D

INDICATOR

TR-1

R15 133.3K 1%

R15A 100 400 100

C7

R8 100K 1%

C8

R9 100K 1%

C9

C10

R10 133.3K 1%

R16 1430 1%

27AM 24 AI

AF BAL

BK

90° AF

TR-2

R17 560

R18 1K

C77 .005

C78 9

R19 1K 1W

R18 1K AF BAL

TR-3

(PK) R-Y +300V

SWA SEC 2

SWA SEC 1

R71 15

R70 15

C11 .001

MODULATION

SHOWN ON SIDEBAND I POSITION

C12 .001

C13 .005

C14 90° RF

47K 1W

R72

C15 5%

R20 560 120MMF

C15A 33MMF (N750)

9000KC

(PK) R-Y +300V

.005 C89

RFC 6 2.5MH

.001 C88

3MMF C87

R22 100K

75MMF 5% C86

MASTER XTAL 9000KC ±1KC

R52 1K CARRIER

R23 1K

C17 .005

BK-R

BL-R (VL)

(W-BK-R)

(W-VL) GR-R

R24 1K

C18 .005

(W-BK-GR) BK-GR

C19 .001-5%

RFC-1 .5MH

C20 .001-5%

L4 BK

L5 BL

C21

C22

150MMF 5%

R26 47K

R25 1K

C23 .005

C52 .005

C25A .005

W-GR

W-BK

GR

R27

BL-OR (W-BK-SL)

R51A 33K

SWD

INDICATOR

R54 100K

CAL. LEVEL

SW B SEC 1

OPERATION

VFO SHOWN POS

BL-BR (W-BK-BR)

R47 10K 5%

R48 100K 5%

R48A 220K

R49A 220K

BR-Y (TN)

GR

SHIELDED WIRE

ALL DC, AC & RF VOLTAGES TAKEN WITH VTVM*

		1	2	3	4	5	6	7	8	9
12AT7 (α) PRE-AMP		112	0	1.7	3.1 AC		120	0	2	3.1 AC
6U8 AF DRIVER MASTER OSC	DC	290	-13	155	"	"	290	0	8.5	0
	RF		17	2			30			
12AT7 (b) AF MODULATOR		295	0	4	"	"	295	0	4	"
6BA7 MIXER	DC	85	-2.3	2	"	"	0	-4	0	280
	RF		5					3.5		18
12BH7 CATH FOLL IND RECT	DC	0	-28	.8	3.1 AC	3.1 AC	280	60	75	3.1 AC
	RF			28				15	10	
2-6AG7 POWER AMP	DC	0	3.1 AC	300	-10	0	300	3.1 AC	300	
	RF				10				175	
12AT7 (c) VOICE AMP RELAY CONT		165	26	27	3.1 AC	3.1 AC	60	.05	.9	3.1 AC
6AL5 VOICE RECT BIAS RECT		-.5	-110	3.1 AC	3.1 AC	86 AC	0	-.15		
6E5 RF IND		3.1 AC	285	-32	315	0	3.1 AC			
5U4 G HV RECT	DC	0	315	0		0		0	315	
	AC		5 TO 8		350		350	2 — 5		

*RF VOLTAGES ARE PEAK MULTIPLY BY .707 FOR RMS

CONDITIONS
OPERATION — MANUAL
CARRIER — MAX
SPEECH LEVEL — OFF
VOX SENS — OFF
RF OUTPUT — 4 MC
IND SW — SET MAX LEVEL
IND LEVEL — MAX

TERMINAL NUMBERS 1 TO 9 OF 9 PIN PLUG IN PS-1 PHASE SHIFT NETWORK

REMOVE BL-R JUMPER IF TALK TO CALIBRATE IS NOT DESIRED

*AUDIO OUTPUT FOR OSCILLOSCOPE TRAPEZOID PATTERNS

K = X 1000 OHMS
M = MEGOHMS

RESISTORS ARE ALL 1/2 WATT EXCEPT WHERE NOTED

IN SOME UNITS A .0068 IS USED IN PLACE OF .006 MF

SWITCHES ARE SHOWN FROM REAR - SEC 1 IS NEXT TO PANEL

IN SOME UNITS A 2.7 MMF IS USED IN PLACE OF 3 MMF

♦ = RECEPTACLE FOR 115 V AC ANTENNA RELAY.

QT-1 SOCKET

W-BL

BL-Y (W-SL)

BK

BR

R-Y (PK)

+300V

W-OR

OPERATION SELECTOR

SW B SEC 2

(MAN)

(VOX)

GR-R (W-VL)

(W-BK-BL) GR-OR

KEY

R-W

R41 1M

R42 47K

R43 470K (PK) R-Y +300V

R44 .68K (TN) BR-Y -100V

R45 F F

R45A 470K

C41 8-450V

2.7K-1W RELAY SENSITIVIT

R46 4.7K-2W R-Y (PK) +300V

RELAY CONTROL

1/2 12AT7(c)

3PDT RELAY (SHOWN ENERGIZED)

12K Ω COIL

RL

W-BK-VL

W-BK-Y

BL-Y (W-SL)

5K-OR (W-BK-OR)

PHONES

RECVR OUTPUT TRANS

SPKR

-100V ON STBY GND ON XMIT BY ACTION OF RELAY RL

CONTACTS 1 & 2 ARE GOLD

R77 1-W 56

C42 .25

SPARES

REAR TERMINAL STRIP 1 TO 10

8 PEAK VOLTS RF MAX.

VFO SOCKET

(TN) BR-Y -100V

CO-AX (W-BK-BR) BL-BR

R47A 220K

-100V ON STBY GND ON XMIT

CHOKE 4H. 100Ω D.C. 210MA 27CF103

(PK) R-Y +300V

OR

C43 40 450V

C44 40

C45 40 150V

R49 100K

1/2 6AL5

BIAS RECT

-100V BR-Y (TN)

VOICE AMP. 1/2 12AT7(c)

VOICE RECT 1/2 6AL5

C38 .002

R35 1M VOX SENS

R36 470K

C39 .05

R38 220K

R39 100K

1M R40A

OR

C40 .25

470K R40

C76 20

R37 1K

C-W

R-Y (PK)

+300V

W-BL

(W-SL) BL-Y

W-BK-VL

W-BK-Y

BL-OR (W-BK-SL)

BL-BR (W-BK-BR)

MIXER 6BA7

CATH. FOLL. IND. RECT. 12BH7

RF IND. 6E5

R64 560 R-Y (PK) +300V

OR-Y (W-Y)

INDICATOR LEVEL

SW D

INDICATOR

R61 1M

W-BR

R-Y (PK)

+300V

L6 OR

C65 .001

C66 3MMF

BL

C67 25MMF 5%

15MC TRAP

R62 100

R63-47K

R28 4.7K 2W

R69A 1K-1W

R69B 68K-2W

C70 .005

C71

C69 .005

C69A .25

R66 1M

W-OR

R56 1K 1W

OR

R26 47K

C52 .005

GR

C25A .005

R26A 180

C26 .006

C27B 3MMF

C27A .000

25MMF-5%

13MC TRAP

L7 YEL

R29 15K 10W

R30 10K

+300V R-Y (PK)

EXT XTAL

R27 180

SW C

VFO-XTAL SHOWN IN VFO POSITION

C24 .001

+300V R-Y (PK)

R67 560

R67A 10K

R68 10K

C73 .005

L10A

L10B

L10C

SW E SEC 5

SW E SEC 4

MIXER

MIXER

C64 .006

C63 380 MMF

MIXER TUNING

C79 .005

L11D

L11C

L11B

L11A

C84 40λ

C83 20λ

C82 15λ

C81 10λ

CATHODE

RFC-2 .5MH

SW E SEC 3

52 OHM OUTPUT

CO-AX

W-R

W-Y

160λ

SW E SEC 2

L12 B

L12 C

W-SL

W-BL

W-GR

ANT.

L12D

L12A

BARE

SW E SEC 1

PA

BAND SWITCH 5 SECTIONS

AMPLIFIER TUNING

C62 380MMF

C53 .01 MF 1600 V.

LINEAR AMPLIFIER

15-R76

6AG7

RFC 7

56-1W

RFC 8

6T

R75 15

C61 .005

C60 .005

C54 .005

C55 .005

C56-005

+300V R-Y (PK)

RFC-4 2.5 MH

RFC-3 .5MH

R60 5.6K

R59 1K 1W

C58 0.1

C57 .005

L8 BL

5MC TRAP

C59 390MMF

BK-GR (W-BK-GR)

ALTERNATE WIRE COLORS ARE SHOWN IN PARENTHESES.
PK = PINK, TN = TAN, VL = VIOLET.

ALL FIL. LEAD PAIRS ARE BROWN & YELLOW

TO ALL FILS.

6.3 V

POWER TRANS. 27PF-274

115 V. 60 ~

C44

1/2 6AL5

5U4GA

R50 100

BIAS RECT

POWER SW.

REV 12-16-57 REV 2-21-58
REV 11-5-56 REV 5-3-57
REV 4-5-55 2-20-56 - 6-14-56
CORRECTED MCD. CKT. 7-21-54
REVISED 6-11-54 6U8-9MC OSC
FOR SERIAL NO. BEGINNING 2242

REV 10-9-58

DRG NO. WW202

SCHEMATIC

MULTIPHASE EXCITER

MODEL 20A

CENTRAL ELECTRONICS, INC.

1247 BELMONT AVE.

CHICAGO 13, ILL.

3-1-54